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Department
of Agriculture
**Forest
Service**

Sequoia
National
Forest/Giant
Sequoia
National
Monument

Western
Divide Ranger
District

April 2014

Draft Environmental Impact Statement

Tule River Reservation Protection Project

Tulare County, California

T21S R30E Sections 1, 12, 13, 14, 15, 16 and T21S R31E Sections 3, 4, 6, 7, 8, 9, 10, 15, 16, 17 and 18, Mount Diablo Base and Meridian.

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Tule River Reservation Protection Project
Draft Environmental Impact Statement

Tulare County, California

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Responsible Official:	**RICHARD I. STEVENS, District Ranger** **1839 South Newcomb** **Porterville, CA 93257**
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Abstract: This draft Environmental Impact Statement (EIS) describes three alternatives for reducing the threat of wildfire entering the Tule River Indian Reservation (Reservation) from National Forest System (NFS) lands. Each alternative responds differently to the major issues and concerns identified during the scoping process. Alternative 1 is the no action alternative. Alternative 2 is the Proposed Action as described in the Notice of Intent published in the Federal Register and the scoping letter dated August 5, 2008. Alternative 3 was developed to reduce the risk of wildfire spreading from Camp Nelson, Mountain Aire, and Bateman Ridge private lands, through NFS lands, and onto the Reservation. Alternative 3 is the preferred alternative.

Reviewers should provide the Forest Service with their comments during the review period of the draft EIS. This will enable the Forest Service to analyze and respond to the comments at one time and to use any additional information in the preparation of the final EIS, thus avoiding undue delay in the decision-making process. Reviewers have an obligation to structure their participation in the National Environmental Policy Act (NEPA) process so that it is meaningful and alerts the agency to the reviewers' position and contentions (Vermont Yankee Nuclear Power Corp. v. NRDC, 435 U.S. 519, 553 (1978)). Environmental objections that could have been raised at the draft stage may be waived if not raised until after completion of the final environmental impact statement (City of Angoon v. Hodel (9th Circuit, l986) and Wisconsin Heritages, Inc. v. Harris, 490 F. Supp. 1334, 1338 (E.D. Wis. 1980)). Comments on the draft EIS should be specific and should address the adequacy of the statement and the merits of the alternatives discussed (40 CFR 1503.3).

Send Comments to:

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Comments must be received by **DATE**.

Summary

The Western Divide Ranger District of the Sequoia National Forest proposes to reduce surface and ladder fuels on approximately 2,830 acres using a combination of activities. Treatments include hand constructing shaded fuel breaks along ridgelines, private land boundaries, and road edges; hand treatments to vary spacing and reduce fuels in planted stands; and prescribed burning in these areas and other areas using jackpot burning, pile burning, and understory burning. The area affected by the proposal includes moderate mid-slopes and relatively gentle ridge tops in the project area, upslope of steep canyons. The majority of the project area is mature mixed conifer forest in and around Black Mountain sequoia grove, in which fire has been suppressed for several decades. This action is needed because of the high and continuous accumulation of woody fuels adjacent to the Tule River Indian Reservation (Reservation) that could result in a stand-replacing event crossing between the Giant Sequoia National Monument and the reservation, or other adjacent private lands.

The purpose of the TRRP Project is to respond to the Tule River Tribal Council's request for action under the 2004 Tribal Forest Protection Act, and to protect, restore, and maintain the Black Mountain Giant Sequoia Grove, the surrounding forest, and the other objects of interest in the project area, by conducting fuels management activities in the Tribal Fuels Emphasis Treatment Area (TFETA) defined in the Giant Sequoia National Monument Management Plan (Monument Plan). The TFETA was designed along the boundary with the Tule River Indian Reservation to not only protect the reservation and its watersheds, but also the objects of interest and watersheds in the Monument, from fires spreading from one to the other.

On July 22, 2004, Congress passed the Tribal Forest Protection Act (Public Law 108-278) in response to devastating wildfires that started on Federal lands and crossed onto adjacent Tribal lands. The Tribal Forest Protection Act (TFPA) provides a tool for tribes to propose work on adjacent federal lands that would reduce the threat of fires starting on those lands from spreading onto trust lands for Indian tribes.

On November 1, 2005, the Tule River Tribal Council of the Tule River Indian Tribe (Tribe), a federally recognized tribe, formally submitted a project request under the authority of the Tribal Forest Protection Act of 2004 to the Forest Supervisor of the Sequoia National Forest. The proposal identified an area for treatment along the northern boundary of the Reservation to address threats to tribal lands. That same month, the Sequoia National Forest Supervisor requested the authority to proceed from the Pacific Southwest Regional Forester, whom agreed that the proposal met the criteria set forth by the TFPA and Forest Service Handbook (FSH) 2409.19, Chapter 60 (USDA 2008a).

Public scoping revealed concerns regarding the number of snags, mastication; and whether the proposed treatments would adequately protect adjacent properties, and reduce the large accumulations of woody debris. These issues led the agency to develop alternatives to the proposed action including:

Alternative 1
Alternative 1 is the no action alternative and would defer and treatment at this time.

Alternative 2
Alternative 2 is the proposed action described above.

Alternative 3

Alternative 3 was developed to address the issues of high snag density; high woody debris concentrations; and the need to reduce the risk of fire spreading from private lands, especially in the upper end of Wilson Creek. This alternative proposes to reduce surface and ladder fuels on approximately 2,830 acres in the project area. Alternative 3 would treat the same areas as Alternative 2, as well as a fourth treatment area to further reduce fuels.

Major conclusions include:

- The data on fire behavior and treatment show that Alternative 3 would best reduce the potential for active crown fire, in part by treating accumulated fuels on an additional 1,500 acres of NFS lands along the boundary with the Reservation.
- Regarding woody debris accumulations and protecting adjacent private lands, Alternative 3 has the greatest potential of the three alternatives to break up fuel concentrations and protect the private lands close to the project area, by reducing fuels in the wildland urban intermix (WUI) surrounding these tracts. Alternative 2 would reduce the accumulated woody debris to a lesser degree and, in doing so would provide more protection to adjacent land owners and tribal lands than Alternative 1.
- In response to the issue regarding snags both as wildlife habitat and a safety hazard, each alternative is likely to retain more snags per acre than required for wildlife habitat by the Monument Plan. However, both action alternatives (Alternatives 2 and 3) include the stipulation that snags or live trees that pose a safety hazard may be felled when clearly needed for firefighter or public safety.
- Canopy cover in the more mature and dense forest habitat types would be retained best in Alternative 3, and least in Alternative 1. In terms of wildlife habitat, though Alternatives 2 and 3 propose treatments in close proximity to known nesting and denning areas, the overall changes in CWHR habitat scores would be minimal in the event of a wildfire occurring after project implementation.

Based upon the effects of the alternatives, the responsible official will decide whether to implement the proposed action as described, the alternative to the proposed action, a modified alternative, or to take no action at this time. The Responsible Official will determine which alternative, or combination of alternatives, should be implemented, determine consistency with the Sequoia National Forest Land and Resource Management Plan as amended, and issue a draft record of decision. This proposed decision would be subject to objection pursuant to 36 CFR 218, Subparts A and B.

Table of Contents

Chapter 1: Purpose of and Need for Action

Introduction

This environmental impact statement (EIS) documents the analysis performed by an interdisciplinary team for the Tule River Reservation Protection (TRRP) Project. The TRRP project area lies in the Western Divide Ranger District within the Giant Sequoia National Monument (Monument) and Sequoia National Forest. It covers approximately 2,830 acres of NFS lands in Tulare County, Township 21 South, Range 30 and 31 East, Mount Diablo Base and Meridian.

The TRRP project area includes forested lands on the north boundary of the Tule River Indian Reservation (Reservation), encompassing portions of the Black Mountain Giant Sequoia Grove, planted conifer stands, mixed conifer forest, and montane chaparral. The project area lies in the higher elevations of the Middle Fork Tule River watershed, with elevations ranging from 4,800 to 7,000 feet.

Background

On July 22, 2004, Congress passed the Tribal Forest Protection Act (Public Law 108-278) in response to devastating wildfires that started on Federal lands and crossed onto adjacent Tribal lands. The Tribal Forest Protection Act (TFPA) provides a tool for tribes to propose work on adjacent federal lands that would reduce the threat of fires starting on those lands from spreading onto trust lands for Indian tribes. The TFPA allows tribes to enter into agreements and contracts with the Forest Service or Bureau of Land Management to accomplish the work.

On November 1, 2005, the Tule River Tribal Council of the Tule River Indian Tribe (Tribe), a federally recognized tribe, formally submitted a project request under the authority of the Tribal Forest Protection Act of 2004 to the Forest Supervisor of the Sequoia National Forest. The Tribe requested that the Secretary of Agriculture enter into an agreement or contract with them to implement one or a series of projects on National Forest System land. The proposal identified an area for treatment along the northern boundary of the Tule River Indian Reservation (Reservation) to address threats to tribal lands:

> Unnaturally high accumulations of vegetative fuels currently exist throughout the area, posing a significant wildfire threat to the adjoining Tribal community and forest resources. The U.S. Forest Service Pacific Southwest Region has identified the area as having a ‘very high’ Fire Hazard and Risk Index, and the Tule River Tribal Community is considered a ‘Community at Risk’ as a result (Sierra Nevada Forest Plan Amendment, Review Team Analysis, 2003). In addition to excessive surface fuels, overstocking of conifer trees exasperates the wildfire hazard while also posing a forest health threat to Tribal forest land. The current condition of the mixed conifer forest presents forest insect and disease threats to the adjoining Reservation Forest as well (Tule River Tribal Council Project Proposal, 2005, p. 2).

The proposal submitted by the Tribe also recognized that the project could “complement similar projects that are planned on Tribal lands located immediately to the south. The project will benefit the Tule River Tribe and Giant Sequoia National Monument, as well as several private ownerships; and will include reduction of the threat of catastrophic wildfire, protection of communities and forest ecosystems, and enhancement of forest health" (Tule River Tribal Council Project Proposal, 2005, p. 3).

In November 2005, the Sequoia National Forest Supervisor sent a letter to the Pacific Southwest Regional Forester requesting the authority to proceed. That same month, the Regional Forester agreed that the proposal met the criteria set forth by the TFPA and Forest Service Handbook (FSH) 2409.19, Chapter 60, and directed the Forest Supervisor to proceed with the next steps for the project (USDA 2008a).

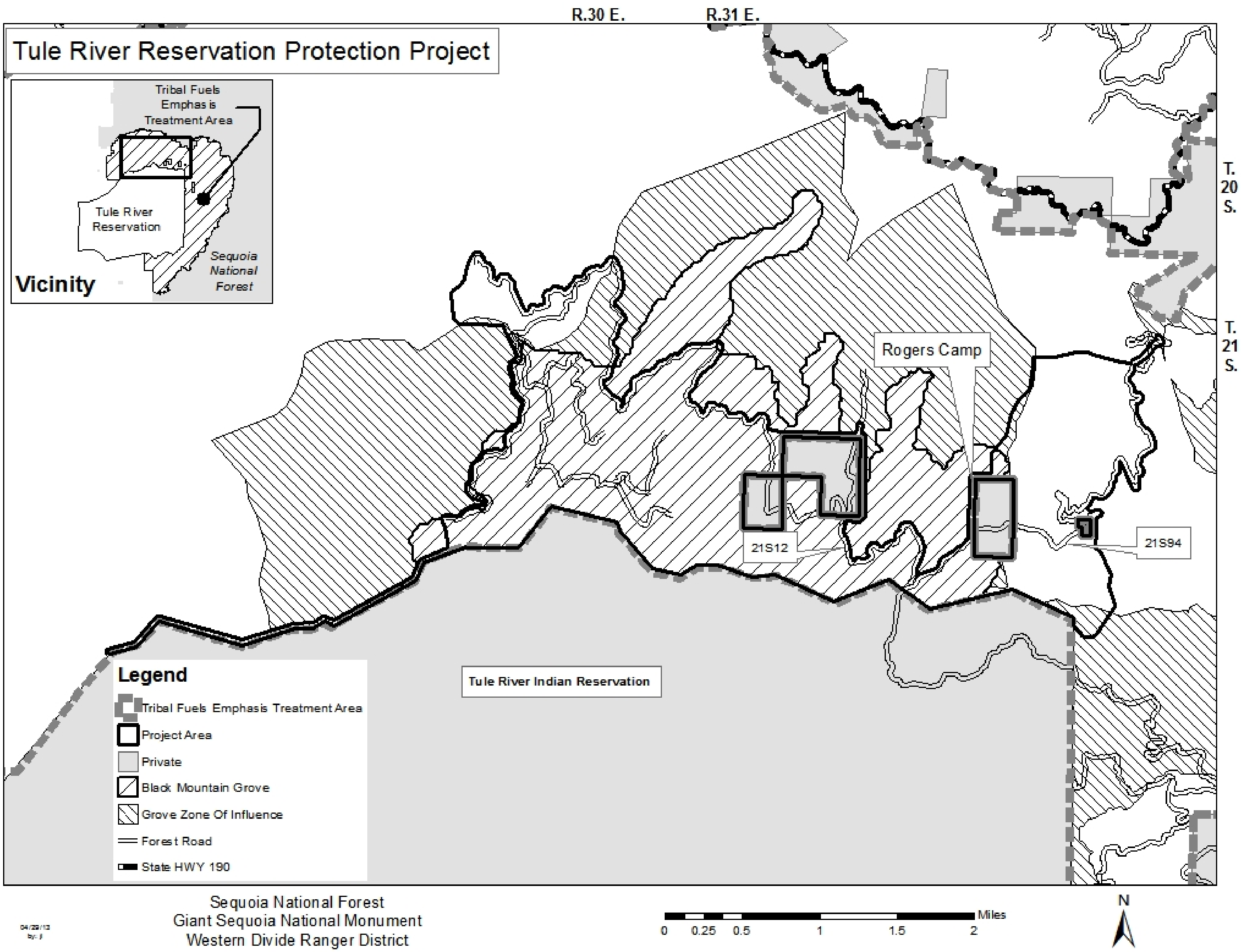
The Tule River Reservation Protection (TRRP) Project area is approximately 2,830 acres on National Forest System lands and about 10 air miles east of the Western Divide Ranger District office in Springville, California (see Figure 1). The project acreage (1,574 acres) first stated in the Notice of Intent was in error, being an estimate of treatment area rather than the entire project area. The only change in the project area since scoping was the acquisition of approximately 73 acres of private land by the Forest Service in 2009.

There are 265 acres of private property in four separate parcels inside the project area boundary. These acres are not included in the project acreage calculations, unless otherwise stated in this document.

The project area is located along the northern boundary of the Reservation. The project area contains part of the Black Mountain Giant Sequoia Grove, and lies entirely within the Tribal Fuel Emphasis Treatment Area (TFETA) defined by the Giant Sequoia National Monument Management Plan (Monument Plan) of 2012 (USDA 2012a) (see Figure 1). The project area boundaries are:

- 200 feet past Forest Road 21S12 on the west and north,
- 200 feet past Forest Road 21S94 on the east, and
- The Reservation boundary on the south.

Figure 1: TRRP Project in relation to the Tribal Fuel Emphasis Treatment Area



Current Management Direction

Monument Plan

The Monument Plan (USDA 2012a) contains the current management direction for the TRRP project area. The TRRP project area lies in the southern portion of the Monument, contains part of the Black Mountain Giant Sequoia Grove, and lies within the TFETA defined by the Monument Plan. The Monument Plan provides management direction for the entire Monument in the form of desired conditions, strategies, objectives, and standards and guidelines to move toward the desired conditions. The applicable management direction for this project is:

Desired Conditions

Vegetation, including Sequoias (Monument Plan, p. 22)

- Forested stands in the Mediterranean climate of the Monument are subject to frequent weather cycles. Years of cooler, wetter weather are often followed by years of hotter, drier weather. The desired condition of a forested stand subject to these extremes is diversity in composition (species, size, age class, distribution) and spatial distribution that are expected to be more resilient to climate changes over time (See Table 1).

Fire and Fuels (Monument Plan, p. 24):

- Fire occurs in its characteristic pattern and resumes its ecological role. Frequent fire maintains lower, manageable levels of flammable materials in most areas, especially in the surface and understory layers. There is a vegetation mosaic of age classes, tree sizes, and species composition, and a low risk for uncharacteristic large, catastrophic fires. The objects of interest are protected; sustainable environmental, social, and economic benefits (such as those associated with tourism) are maintained; and the carbon sequestered in large trees is stabilized.

Air Quality (Monument Plan, p. 24)

- Emissions generated by the Monument are limited and managed, and clean air is provided for the Monument and surrounding communities.

Strategies

Climate Change/Carbon Sequestration (Monument Plan, p. 45)

- Improve the potential for forest ecosystems to return to desired conditions following natural disturbances, such as through the use of prescribed fire, managed wildfire, or mechanical treatments to reduce ladder fuels or tree densities (Strategy #6).

Vegetation, Ecological Restoration (Monument Plan, p. 45

- Accomplish ecological restoration, in part, through the reduction of fuels by decreasing down woody material, ladder fuels, and brush (Strategy #9).
- Promote heterogeneity in plantations and young stands by encouraging more diversity in species composition and age. Reduce stand density in young stands and encourage shade-intolerant species such as giant sequoia, pine, and oak (Strategy #10).
- Promote resiliency in Monument ecosystems by using the following tools, in order of priority: prescribed fire, mechanical treatment, managed wildfire (when available) (Strategy #13).

Fire and Fuels/Ecological Restoration (Monument Plan, p. 48)

- Prioritize treatments for fuels reduction and ecological restoration by land allocations/management areas as follows:
  1. WUI defense zones
  2. Tribal fuels emphasis treatment area (TFETA) areas of high and moderate fire susceptibility within 1/4-mile of the reservation boundary (See Figure 1))
  3. WUI threat zone
  4. Giant sequoia groves (not previously treated in 1 through 3)
  5. TFETA areas of high fire susceptibility (not previously treated in 2)
  6. Old forest emphasis areas (not previously treated in 1 through 5) (Strategy #10).

Fuels Reduction (Monument Plan, p. 48)

- Locate fuel treatments and manage wildfires (when available) across broad landscapes so that the spread and intensity of wildfire is reduced (Strategy #11).
- Focus fuel treatments in the TFETA to slow the spread of fire and to protect the objects of interest in the Monument, the reservation, and their watersheds from severe fire effects. The first priority for fuel reduction treatments in the TFETA is those areas within 1/4 mile of the reservation boundary with high and moderate fire susceptibility, and in the Long Canyon area (Strategy #12).
- Use the following tools for fuels reduction, in order of priority: managed wildfire (when available), prescribed fire, mechanical treatment (Strategy #13).

WUI Management (Monument Plan, p. 48)

- Allow low, moderate, and high intensity fires to burn in the Monument, including within giant sequoia groves (Strategy #14).
- Provide a minimum 100-foot defensible space (CFR Section 4291) for all structures on administrative sites, structures authorized by permit, and for developments adjacent to National Forest System lands (Strategy #15).

Wildlife (Monument Plan, pp .51-52)

- Protect, increase, and perpetuate old forest ecosystems and provide for the diversity of native plant and animal species associated with old forest ecosystems (Strategy #2).
- Protect high value wildlife habitat from management activities using species-specific standards and guidelines based on land allocations such as Protected Activity Centers (PACs), Home Range Core Areas (HRCAs), den site buffers (Strategy #3).
- Protect high quality fisher habitat from any adverse effects from management activities, evaluating the effects of site-specific projects with models appropriate to the scale of the project (Strategy #4).
- To protect aquatic, riparian, and meadow ecosystems, use streamside management zones, the aquatic management strategy, and the riparian conservation objectives for riparian conservation (RCAs) and critical aquatic refuges (CARs) (Strategy #5).
- Manage California condor habitat following the most current U.S. Department of the Interior (USDI) Fish and Wildlife Service California Condor Recovery Plan. Contribute to the recovery of the California condor by protecting roosting and potential nesting sites (Strategy #6).
- Minimize the spread of existing infestations and the introduction of invasive non-native species (noxious weeds) (Strategy #10).

Objectives

- Re-introduce fire to achieve ecological restoration goals in the giant sequoia groves on an average of 5 percent of grove acres per year, according to their fuel load reduction plans (Objective #3).

Table 1: Management Direction for Ecological Restoration (Monument Plan, p. 77, Table 46)

Land Allocation/Species	Focus	Diameter Limit (inches)
General Monument	Protection Resiliency Heterogeneity	20 (conifers) 12 (hardwoods)
Old forest emphasis	Protection Resiliency Heterogeneity	20
Wildland urban intermix (WUI): defense zone	Protection Public safety Resiliency	20
Giant sequoias outside WUI	Protection Resiliency	12
Giant sequoias inside WUI defense zone	Protection Resiliency Giant sequoia regeneration	12
Giant sequoias inside WUI threat zone	Protection Resiliency Giant sequoia regeneration	12
Tribal Fuels Emphasis Treatment Area (TFETA)	Protection Public safety Resiliency	20

Standards and Guidelines (S&Gs)

Giant Sequoia Groves (Monument Plan, p. 83)

- Protect and manage giant sequoias to perpetuate the species and preserve old growth specimen trees (S&G #12).

Young Stands, Including Plantations (Monument Plan, p. 84)

- In young stands of trees, apply the necessary silvicultural and fuels reduction treatments to: (a) accelerate the development of old forest characteristics, (b) increase stand heterogeneity, (c) promote hardwoods, and (d) reduce risk of loss to wildland fire. Use mechanical fuels treatments to remove the material necessary to achieve the following outcomes if the treated plantation was to burn under 90th percentile fire weather conditions: (a) wildland fire would burn with average flame lengths of 2 to 4 feet, (b) the rate of fire spread would be less than 50 percent of the pre-treatment rate of spread, and (c) fireline production rates would be doubled. Achieve these outcomes by reducing surface and ladder fuels and adjacent crown fuels. Treatments should be effective for more than 5 years (S&G #23).

Fire and Fuels (Monument Plan, p. 84)

- Use the most recent inventories of fuel load to develop a fuel load reduction plan for each giant sequoia grove (within its administrative boundaries) (S&G #1).
- For prescribed fire treatments, use multiple entries, as needed, to achieve fuels management objectives, up to two burns per decade and four burns over 20 years (S&G #5).

Air Quality (Monument Plan, p. 87)

- Minimize smoke emissions by following best available control measures (BACMs). Avoid burning on high visitor days. Notify the public before burning (S&G #3).
- Coordinate and cooperate with other agencies and the public to manage air quality. Conduct prescribed burns when conditions for smoke dispersal are favorable, especially away from sensitive or class 1 areas. Use smoke modeling tools to predict smoke dispersion (S&G #4).

Wildlife Habitat (Monument Plan, pp. 87-91)

- Fell and/or remove snags as needed to address imminent safety hazards (S&G #1).
- Manage snag levels for ecological restoration. Within green forests, design projects to provide a sustainable population of medium- and large-diameter snags. Existing medium- and large-diameter snags, as well as medium- and large-diameter living trees that exhibit form and/or decay characteristics regarded as important wildlife habitat (e.g., have substantial wood defect, teakettle branches, broken tops, large cavities in the bole, etc.), will form the backbone snag network over large landscapes (S&G #2).
- Retain felled hazard trees on the ground where needed to achieve down woody material standards of 10 to 20 tons per acre in logs greater than 12 inches in diameter (S&G #3).
- California spotted owl - Maintain a limited operating period (LOP), prohibiting activities within approximately ¼ mile of the nest site during the breeding season (March 1 through August 15) unless surveys confirm that California spotted owls are not nesting. The LOP does not apply to existing road and trail use and maintenance or continuing recreation use, expect where analysis of proposed project or activities determines that either existing or proposed activities are likely to result in nest disturbance (S&G #18).
- In PACs located outside the defense zone of the WUI: Limit stand-altering activities to reducing surface and ladder fuels through prescribed fire treatments. In forested stands with overstory trees 11 inches dbh and greater, design prescribe fire treatments that have an average flame length of 4 feet or less. Prior to burning, conduct hand treatments, including handline construction, tree pruning, and cutting of small trees (less than 6 inches dbh), within a 1 – to 2 –acre area surrounding known nest trees, as needed, to protect nest trees and trees in their immediate vicinity (S&G #22). [This applies to California spotted owl PAC TUL0201]
- In PACs located inside the defense zone of the WUI: Prohibit mechanical treatments within a 500-foot radius buffer around the California spotted owl activity center. Allow prescribed burning within the 500-foot radius buffer. Prior to burning, conduct hand treatments, including handline construction, tree pruning, and cutting of small trees (less than 6 inches dbh), within a 1-to 2-acre area surrounding known nest trees, as needed, to protect nest trees and trees in their immediate vicinity. The remaining area of the PAC may be mechanically treated to achieve the fuels reduction outcomes described for General Monument land allocations (S&G #23). [This applies to California spotted owl PACs TUL0012, TUL0013, and TUL0173]
- Maintain a limited operating period (LOP), prohibiting activities within approximately ¼ mile of the nest site during the breeding season (February 15 through September 15) unless surveys confirm that northern goshawks are not nesting. If the nest stand is unknown, either apply the LOP to a ¼-mile area surrounding the PAC or survey to determine the nest stand location. The LOP does not apply to existing road and trail use and maintenance or continuing recreation use, expect where analysis of proposed project or activities determines that either existing or proposed activities are likely to result in nest disturbance (S&G #35).

- Prior to vegetation treatments, identify important wildlife structures, such as large diameter snags and coarse woody debris within the treatment unit. For prescribed fire treatments, use firing patterns, fire lines around snags and large logs, and other techniques to minimize effects on snags and large logs. Evaluate the effectiveness of these mitigation measures after treatment (S&G #48).
- Protect fisher den site buffers from disturbance with a LOP form March 1 through June 30 for all new project as long as habitat remains suitable for until another regionally approved management strategy is implemented. The LOP may be waived for individual project of limited scope and duration, when a biological evaluation documents that such projects are unlikely to result in breeding disturbance considering their intensity, duration , timing and specific location (S&G #50).
- Avoid fuels treatments in den site buffers to the extent possible. If areas within den site buffers must be treated to achieve fuels objectives for the WUI zone, limit treatments to mechanical clearing of fuels. Treat ladder and surface fuels over 85 percent of the treatment unit to achieve fuels objectives. Use piling or mastication to treat surface fuels during initial treatment. Burning of piled debris is allowed. Prescribed fire may be used to treat fuels if no other reasonable alternative exists (S&G #52). [Only fisher den sites known in the TRRP Project]
- Protect marten den site buffers from disturbance with a LOP form May 1 through July 31 for all new project as long as habitat remains suitable for until another regionally approved management strategy is implemented (S&G #55).

Cultural Resources (Monument Plan, p. 104)
- Fully integrate opportunities for preservation, protection, and utilization of cultural resources into land use planning and decisions through:
  (1) Assessing potential effects on heritage resources on a project-specific basis.
  (2) Avoiding or mitigating effects on sites eligible for the National Register or other significant sites.
  (3) Follow-up monitoring to assess the effectiveness of management procedures.
  (4) Post and sign (e.g., tractors prohibited, Antiquities Act) selected cultural resource sites where such signing will not endanger the sites.
  (5) Monitor number of sites for protection visits on revolving basis, and prioritize according to resource significance and vulnerability as developed in the forest overview.
  (6) Develop and provide interpretive brochures for selected sites (S&G #1).
- Regularly consult with Native Americans as interested parties on proposed undertakings (S&G #4).

Fuel Load Reduction Plan
The 2012 Monument Plan (USDA 2012a) requires that a fuel load reduction plan be prepared for each giant sequoia grove in the Monument, using the most recent inventories of fuel load to evaluate the need for treatment. The *Fuel Load Reduction Plan for the Black Mountain Giant Sequoia Grove* was originally written in July 2008, and was updated in September 2013 (Ernst 2013). Fuel treatment goals for the Black Mountain Grove identified in 2013 include:
- Maintain lower, manageable levels of surface and ladder fuels to reduce the risk of uncharacteristic stand-replacing fires.
  - Reduce fuels along property boundaries, roads, and ridgelines, to reduce the risk of fire spreading from or into private land. Reduce fuel loading and continuity along the boundary with the Tule River Indian Reservation (TRIR) to reduce the risk of fire spreading across the boundary. As conditions allow, conduct joint fire treatments with TRIR.

- Restore fuel conditions such that an average live crown base tree height of 20 feet and average flame lengths of six feet or less can be maintained should a wildfire occur under 90th percentile fire weather conditions.
- During fuel load reduction activities, emphasize the protection of large giant sequoia trees and large trees of other species including pines.
    - Reduce the number of shade-tolerant trees that act as ladder fuels in order to protect large giant sequoias, and to encourage regeneration and growth of fire-adapted giant sequoia and pine species.

National Direction

Legislative authorities for administration of the NFS fuels management program are listed in Forest Service Manual (FSM) 5150 (USDA 1991). Objectives, policies, and responsibilities for fuels management are in FSM 5150, specifically:

- The objective is "to identify, develop, and maintain fuel profiles that contribute to the most cost-efficient fire protection and use program in support of land and resource management direction in the forest plan" (FSM 5150.2) (USDA 1991).

Forest Service Handbook 2409.19, Chapter 60, provides direction regarding the Tribal Forest Protection Act (USDA 2008a). Specifically, the handbook allows contracts or agreements to carry out projects to protect Indian forest lands.

Other key manual direction regarding tribal interests includes:

- FSM 2360-Heritage Program Management (USDA 2008b) establishes policy to:
    - Establish and maintain effective relationships with federal, state, Tribal, and local governments and historic preservation organizations at all levels of the agency to ensure protection of cultural resources and to promote Heritage Program efficiencies.
    - Protect cultural resources from the effects of Forest Service or Forest Service-authorized undertakings, unauthorized use, and environmental damage (FSM 2360.3) (USDA 2008b).
- FSM 1500-External Relations, Chapter 1560-State, Tribal, County, and Local Agencies; Public and Private Organizations (USDA 2012b). Forest Service objectives for tribal relations are:
    - To develop and maintain effective working relationships with American Indian and Alaska Native Tribes taking into account the cultural concerns and interests of Tribes.
    - To ensure that Forest Service officials, programs, and activities respect tribal self-government and sovereignty and honor tribal rights and interests.
    - To ensure consultation with Tribes when undertaking the formulation and implementation of policies that may have tribal implications, as defined in Executive Order 13175, Consultation and Coordination with Indian Tribes (FSM 1563.01g, para.1).
    - To establish and ensure effective government-to-government working relationships with Tribes to achieve the common goal of promoting and protecting ecosystem health. (FSM 1563.02)

Purpose Of and Need for Action

The purpose of the TRRP Project is to respond to the Tule River Tribal Council's request for action under the 2004 Tribal Forest Protection Act, and to protect, restore, and maintain the Black Mountain Giant Sequoia Grove, the surrounding forest, and the other objects of interest in the project area, by conducting fuels management activities in the Tribal Fuels Emphasis Treatment Area (TFETA) defined in the Giant Sequoia National Monument Management Plan (Monument

Plan). The TFETA was designed along the boundary with the Tule River Indian Reservation to not only protect the reservation and its watersheds, but also the objects of interest and watersheds in the Monument, from fires spreading from one to the other.

The need is to reduce the accumulation of woody fuels adjacent to the reservation in order to:

- Prevent unwanted wildland fire from spreading onto the Tule River Indian Reservation from the project area.
- Move the project area toward the desired conditions in the Monument Plan for Fire and Fuels in the TFETA.

Proposed Action

The proposed action is to reduce surface and ladder fuels on approximately 1,410 acres using a combination of activities. Treatments include hand constructing shaded fuel breaks along ridgelines, private land boundaries, and road edges; hand treatments to vary spacing and reduce fuels in planted stands; and prescribed burning in these areas and other areas using jackpot burning, pile burning, and understory burning techniques.

The proposed action has been modified since scoping in August 2008. In 2009, a privately-owned parcel in Rogers Camp was acquired by the Forest Service in a land exchange. The original proposed action included a 300-foot fuel break along the boundary of this private land. Part of the fuel break is no longer necessary due to the land exchange, so the proposed action has been modified to construct the fuel break around the current privately-owned portion of Rogers Camp, and proposes other fuel reduction treatments in the portion acquired by the Forest Service.

The scoping letter also included a proposal for mastication in some of the planted stands, and removing material from shaded fuelbreak construction as biomass. Felling of trees up to 14 inches in diameter was allowed in the planted stands. The proposals for mastication and biomass removal have been eliminated from the proposed action because they are not feasible. These activities are considered in alternatives eliminated from detailed study. The diameter limit for all the fuels reduction activities in the project area has been lowered to 12 inches.

The proposed action is described in more detail in Chapter 2 (Alternative 2).

Decision Framework

Given the purpose and need, the Responsible Official will review the proposed action, the other alternatives, and their environmental consequences. The decision to be made is whether to implement the proposed action as described, the alternative to the proposed action, a modified alternative, or to take no action at this time. The Responsible Official will determine which alternative, or combination of alternatives, should be implemented, determine consistency with the Sequoia National Forest Land and Resource Management Plan as amended, and issue a draft record of decision. This proposed decision is subject to objection pursuant to 36 CFR 218, Subparts A and B.

Public Involvement

The Forest Service issued a news release describing the preliminary TRRP Project on February 28, 2006. A letter soliciting input about the proposal was sent to 37 interested individuals on March 2, 2006. Two responses were received.

The TRRP Project was added to the Sequoia National Forest's Schedule of Proposed Actions (SOPA) in June 2006. A field trip to the project area, scheduled for September 2, 2006, was announced in a news release on August 21, 2006, and in a letter sent to the pre-scoping list of interested individuals. The field trip was attended by 27 individuals. Suggestions regarding the project were incorporated into the proposal. Another field trip to the project area was held on October 26, 2007 with 15 people attending.

The Notice of Intent (NOI) was published in the *Federal Register* and the scoping letter was mailed on August 26, 2008, initiating a 30-day scoping period for the TRRP Project. There were 10 responses to scoping containing several concerns and suggestions regarding the proposed action. These scoping comments from the public are in the project record on file at the Western Divide Ranger District Office in Springville, California.

Another field trip was conducted on August 9, 2013. The field trip was attended by Tribal representatives, local property owners within the project area, and other interested parties. No new issues were raised during that field trip.

Issues

Scoping responses from the public, other agencies, and the Tribe were used to formulate issues concerning the proposed action. The Forest Service separated the issues into two groups: significant and non-significant. Significant issues were defined as those directly or indirectly caused by implementing the proposed action. Non-significant issues were identified as those: 1) outside the scope of the proposed action; 2) already decided by law, regulation, Forest Plan, or other higher level decision; 3) irrelevant to the decision to be made; or 4) conjectural and not supported by scientific or factual evidence. The Council on Environmental Quality (CEQ) NEPA regulations explain this delineation in Sec. 1501.7, "…identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review (Sec. 1506.3)…" (40 CFR 1500). A list of issues and the reasons why some were found non-significant are in the project record on file at the Western Divide Ranger District Office.

The Forest Service identified the following issues for the TRRP Project:

1. **Abundance of Snags**: There is a concern that the proposed action would not treat enough snags to be effective in reducing fire spread, as well as a concern that the proposed action would treat too many snags:
    - The Proposed Action does not treat a sufficient number of snags along Forest Service Roads 21S94 and 21S12 to be effective in reducing the risk of fire spread and to provide firefighters with a safe, effective area to fight fires.
    - The proposed action is inconsistent with the inventory information. The inventory says the project area has an excessive number of snags, and the proposed action say snags should be retained, even if they occur in clumps.

    How issue was addressed: Both comments included recommendations to consider adding a snag guideline as part of the treatment for the Tule River Reservation Protection Project. *The key indicator for this issue is average number of snags per acre.*

2. **Woody Debris Concentrations:** There is a concern that the Proposed Action would not sufficiently treat the large accumulations of woody debris along Forest Roads 21S94 and 21S12 to provide an effective barrier and improve firefighter safety when fires burn up the steep slopes from the Tule River.

   How issue was addressed: The key indicator for this issue is expected fire behavior in surface fires, and passive and active crown fires. Alternative 3 is designed, in part, to respond to this issue.

3. **Private Land:** There is a concern that the Proposed Action would not be effective in treating the current heavy fuel loads on steep terrain and therefore reducing the spread of fire from the private lands, especially in the upper end of Wilson Creek and near Bateman Ridge, Simmons Post Camp, Camp Nelson, Rogers Camp, and Mountain Aire.

   How issue was addressed: The key indicator for this issue is acres of fuel reduction treatment. Alternative 3 is designed, in part, to respond to this issue.

4. **Mastication:** There is a concern that mastication can inhibit the natural germination of plants, which would interfere with the restoration of plantations back to their natural conditions. Concerns about the ability and impacts of using fire after mastication were: could fire be used after mastication, how fire would behave, how hot would it burn, and whether the mastication was planned as the first step to prepare for fire.

   How issue was addressed: Though mastication was proposed as a treatment in planted stands in the scoping letter, it has been dropped from this project. Mastication is not proposed in any of the alternatives considered in detail (see Alternatives Eliminated from Detailed Study).

Chapter 2: Alternatives, including the Proposed Action

Introduction

This chapter describes and compares the alternatives considered for the Tule River Reservation Protection (TRRP) Project. It includes a description and map of each alternative considered in detail, as well as a discussion of those alternatives eliminated from detailed study. This section also presents the alternatives in comparative form, sharply defining the differences between each alternative and providing a clear basis for choice among options by the decision maker and the public.

Alternatives Considered in Detail

Based on the issues identified during scoping, the Forest Service developed one alternative proposal that meets the purpose and need differently than the proposed action. In addition, the Forest Service is required to analyze a no action alternative. Alternatives 1 (No Action), Alternative 2 (Proposed Action), and Alternative 3 (Additional Fuels Treatments) are described in detail below.

Alternative 1

Under Alternative 1, current management plans would continue to guide management of the project area. No fuel reduction activities would be implemented to treat surface and ladder fuels and reduce the risk of wildland fire spreading from NFS lands onto the Tule River Indian Reservation. The purpose and need for the TRRP Project would not be achieved: the Tule River Tribal Council's request for action under the 2004 Tribal Forest Protection Act would not be granted, and no fuel treatments would be conducted to protect, restore, and maintain the Black Mountain Giant Sequoia Grove, the surrounding forest, and the other objects of interest in the project area (see Figure 1).

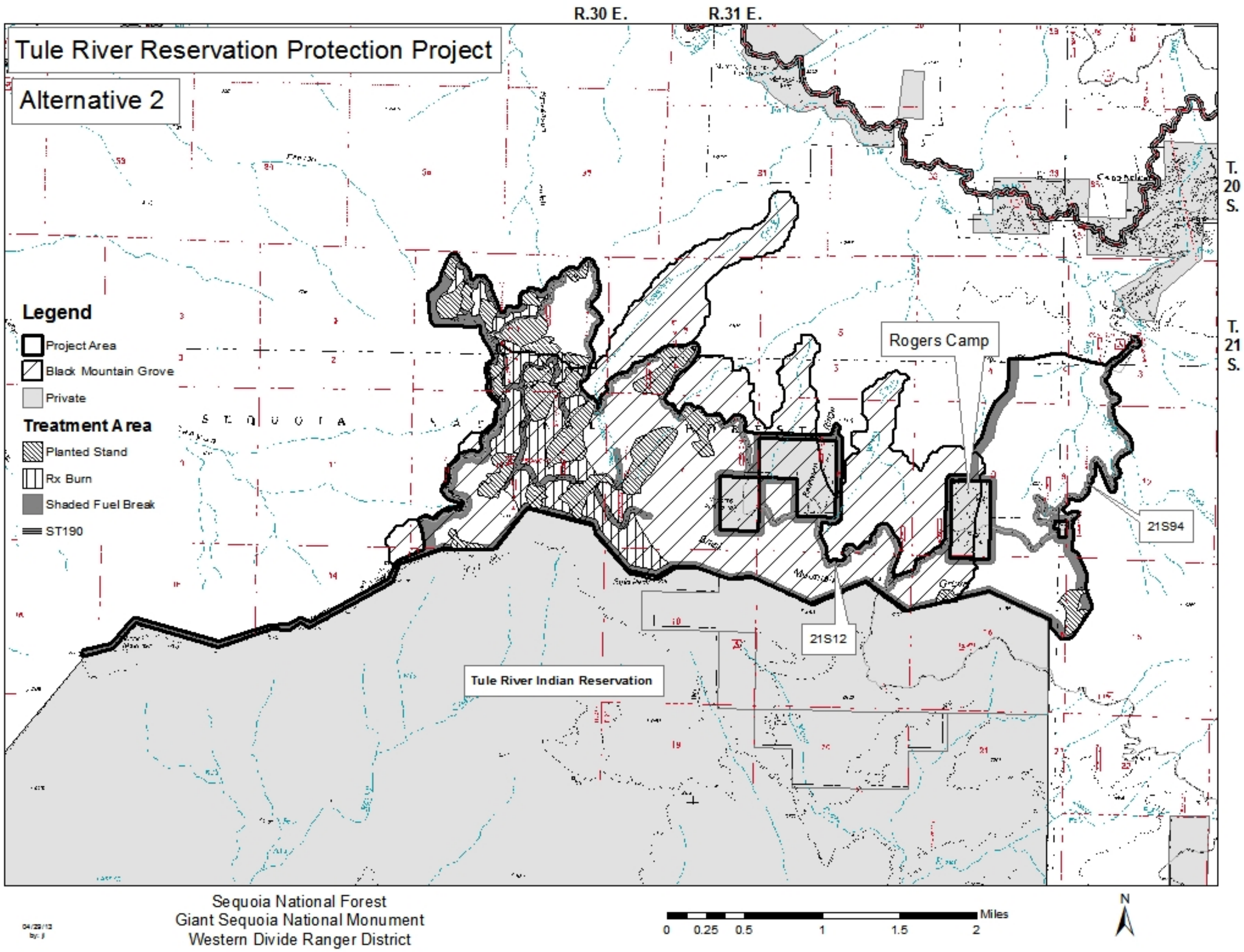
Alternative 2 (Proposed Action)

The proposed action is to reduce surface and ladder fuels on approximately 1,410 acres using a combination of activities. Treatments include hand constructing shaded fuel breaks along ridgelines, private land boundaries, and road edges; hand treatments to vary spacing and reduce fuels in planted stands; and prescribed burning in these areas and other areas using jackpot burning, pile burning, and understory burning techniques (see Figure 2).

The proposed action has been modified since scoping in August 2008. In 2009, a privately-owned parcel in Rogers Camp was acquired by the Forest Service in a land exchange. The original proposed action included a 300-foot fuel break along the boundary of this private land. Part of the fuel break is no longer necessary due to the land exchange, so the proposed action has been modified to construct the fuel break around the current privately-owned portion of Rogers Camp, and proposes other applicable fuel reduction treatments in the portion acquired by the Forest Service.

The scoping letter also included a proposal for mastication in some of the planted stands, and removing material from shaded fuelbreak construction as biomass. Felling of trees up to 14 inches in diameter was allowed in the planted stands. The proposals for mastication and biomass removal have been eliminated from the proposed action because they are not feasible (see the discussion of alternatives eliminated from detailed study later in this chapter). The diameter limit for all the fuels reduction activities in the project area has been lowered to 12 inches.

Figure 2: Alternative 2 Treatment Areas



The intent of Alternative 2 (Proposed Action) remains the same as was published in the Notice of Intent, though the treatment descriptions have been modified for clarification. There are three types of treatment areas in Alternative 2: planted stands, shaded fuel breaks, and understory burning, each with a specific set of prescriptions described in the following paragraphs (see Figure 2).

Some of the down woody material from fuels reduction may be removed as firewood under the terms and conditions of fuelwood permits. Firewood cutting and gathering is prohibited inside giant sequoia grove administrative boundaries, unless an exception is granted based on specific site conditions or circumstances (Monument Plan, p. 39), but is a suitable activity in the TFETA (Monument Plan, p. 42).

The project area is within the old forest emphasis land allocation of the Monument. Snags are an important component of old forest habitat in this land allocation. Therefore, unless an individual tree is deemed an imminent hazard during project implementation, all dead trees over 15 inches diameter at breast height (dbh) would be retained in accordance with Monument Plan standards and guidelines.

Planted Stands

The TRRP project area contains approximately 400 acres of planted stands, ranging in age from 30 to 50 years. Alternative 2 proposes to reduce fuels as well as create more heterogeneity and resiliency in these planted stands, by using hand treatments to vary tree spacing in multiple directions (upslope, downslope, side slope, etc.). Treatments include:

- Varying spacing to favor retention of the largest trees, according to the following species priority:
    1. All trees greater than 12 inches dbh
    2. Giant sequoia
    3. Black oak
    4. Pine
    5. An average of five hardwoods per acre.
- Felling trees up to 12 inches dbh following the priority list.
- Where the largest trees are smaller than eight inches in diameter, thinning to 100 trees per acre (average tree spacing of 20 feet).
- Where the largest trees are eight inches in diameter and larger, thinning trees to 70 trees per acre (average tree spacing of 25 feet).
- Removing a sufficient amount of surface fuels to produce an average flame length of four feet or less, by piling and burning existing down woody material between one and eight inches in diameter.
- Limbing leave trees where necessary to reduce fire risk.
- After previous treatments, jackpot burning and pile burning to reduce fuel loading.
- Retaining snags larger than 15 inches dbh unless they pose an imminent safety threat to personnel.

Shaded Fuel breaks

Alternative 2 would use hand treatments to establish several fuel breaks on approximately 730 acres of the project area. Based on terrain and vegetation features, these fuelbreaks would vary from 150 to 400 feet in width (see Figure 2), as follows:

1) Construct a 150-foot-wide shaded fuel break along the northern boundary of the Reservation and to the east of Black Mountain in sections 15 and 16.
2) Construct a 200-foot-wide shaded fuel break (100 feet on both sides of the road) along Forest Roads 21S94, 21S12 (from 21S94 to 21S25), 21S12B, 21S25, 21S25A, 21S25B, 21S25C, 21S25D, and 21S58.
3) Construct a 200-foot-wide shaded fuel break on NFS land adjacent to private property.
4) Construct a 300-foot-wide shaded fuel break along the eastern boundary of the project area.
5) Construct a 400-foot-wide shaded fuel break along the western boundary of the project area.

Construction of the shaded fuel breaks would include one or more of the following treatments:

- Fell shade-tolerant tree species (incense cedar, white fir, and red fir) and retain giant sequoia, oak, and pine trees.
- Remove sufficient surface fuels to produce an average flame length of four feet or less after project completion, by piling existing down woody material between one and eight inches in diameter.
- Remove sufficient ladder fuels to meet an average canopy base height of 20 feet, by:
    - Cutting and piling brush.
    - Felling and piling trees up to 12 inches dbh to achieve an average of no more than 70 trees per acre (average tree spacing of 25 feet).
- Where shaded fuel breaks and spotted owl protected activity centers overlap (approximately 130 acres), cut and pile brush and trees less than six inches dbh.
- Retain snags greater than 15 inches dbh unless they pose an imminent threat to personnel.
- After the treatments above, use jackpot burning and pile burning to reduce fuel loading.

Understory Burn

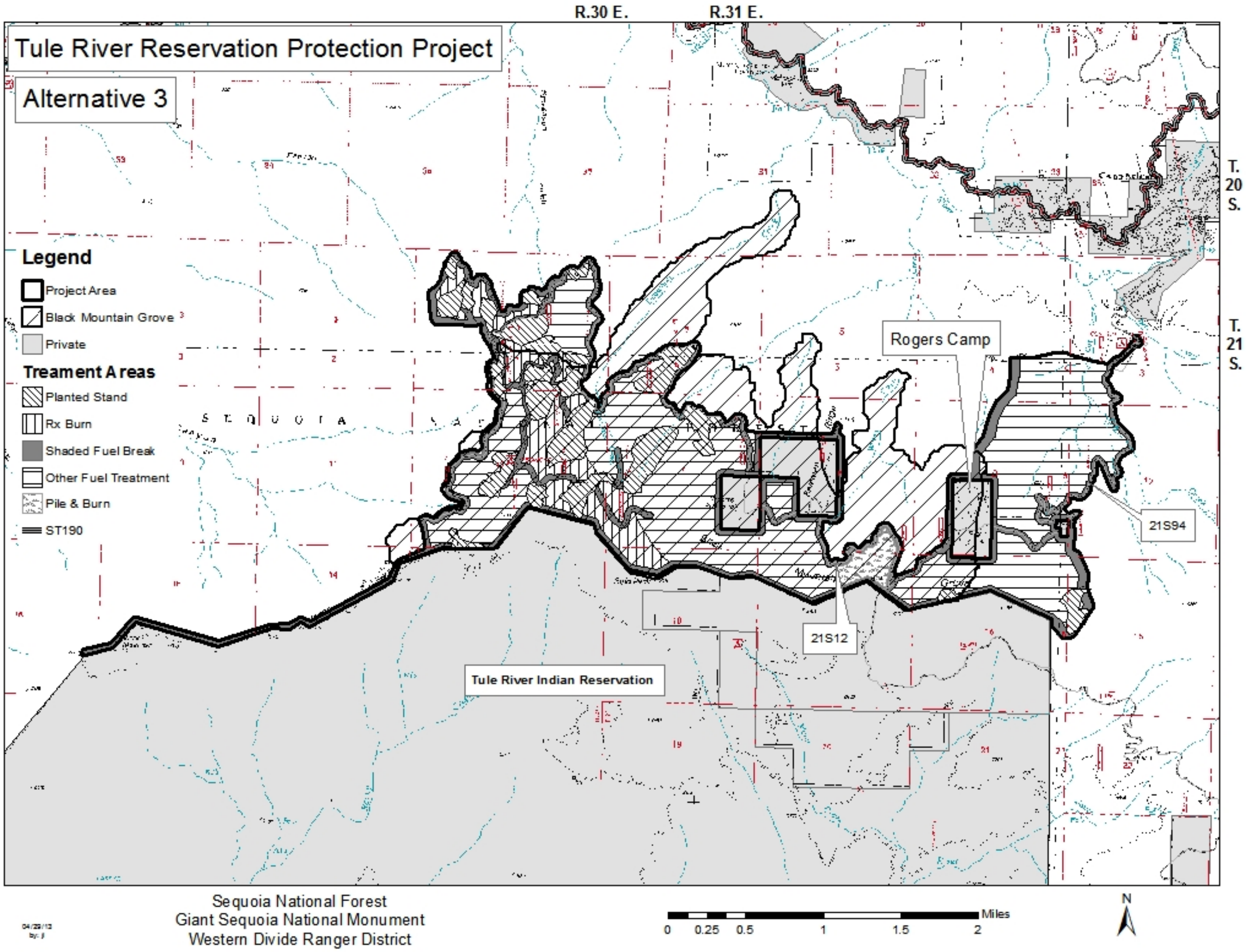
Understory burning is proposed on approximately 280 acres between the planted stands and some of the shaded fuel breaks (see Figure 2). This prescribed burning would reduce surface fuels to retain an average of 15 tons per acre. In the burn area, hand crews would construct fire lines, and prune or fell incidental small trees, generally less than six inches dbh, prior to burning. Snags greater than 15 inches dbh would be retained, unless they pose an imminent threat to personnel during implementation.

Alternative 3

Alternative 3 was developed to address the issues of high snag density; high woody debris concentrations along Forest Roads 21S94 and 21S12; and the need to reduce the risk of fire spreading from Camp Nelson, Rogers Camp, Simmons Post Camp, Mountain Aire, and Bateman Ridge private lands, especially in the upper end of Wilson Creek. This alternative proposes to reduce surface and ladder fuels on approximately 2,830 acres in the project area. Alternative 3 would treat the same areas as Alternative 2, as well as a fourth treatment area to further reduce fuels (See Figure 3):

- Planted Stands
- Shaded Fuel Breaks
- Understory Burning
- Other Fuel Treatments

Figure 3: Alternative 3 Treatment Areas



The treatments proposed for the planted stands and the understory burning would be the same as those described under Alternative 2. However, in Alternative 3, the understory burning would treat 40 fewer acres than those proposed in Alternative 2, covering approximately 240 acres between the planted stands and some of the shaded fuel breaks (see Figure 3). The minor differences in the shaded fuelbreak treatments in Alternative 3, and the other fuel treatments proposed in this alternative, are described below.

Shaded Fuel Breaks

Alternative 3 would use hand treatments to establish several fuelbreaks on approximately 690 acres of the project area. Some of the fuelbreaks would be narrower than those proposed in Alternative 2, because of the added fuel treatment areas proposed in Alternative 3. Based on terrain and vegetation features, these fuelbreaks would vary from 150 to 300-feet in width:

1) Construct a 150-foot-wide shaded fuel break along the northern boundary of the Reservation and to the east of Black Mountain in sections 15 and 16.
2) Construct a 200-foot-wide shaded fuel break (100 feet on both sides of the road) along FRs 21S94, 21S12 (from 21S94 to 21S25), 21S12B, 21S25, 21S25A, 21S25B, 21S25C, 21S25D, and 21S58.
3) Construct a 200-foot-wide shaded fuel break on NFS land adjacent to private property.
4) Construct a 300-foot-wide shaded fuel break along the eastern and northwestern boundaries of the project area.

Construction of the shaded fuel breaks in Alternative 3 would include the same set of treatments proposed in Alternative 2.

Other Fuel Treatments

In addition to the 240 acres of underburning between planted stands and the shaded fuelbreaks, Alternative 3 proposes approximately 1,500 more acres of fuels reduction treatments than Alternative 2. These treatments would focus on reducing surface and ladder fuels in more of the areas between the planted stands and the shaded fuelbreaks, and in the eastern portion of the project area (see Figure 3) using the following criteria:

- Remove sufficient surface fuels to produce an average flame length of less than six feet after project completion, by hand piling existing down woody material up to 8 inches in diameter.
- Remove sufficient ladder fuels, to meet an average canopy base height of 20 feet, by:
  - Cutting and piling brush.
  - Felling and piling trees up to 12 inches dbh to achieve an average of no more than 70 trees per acre (average tree spacing of 25 feet).
- Retain snags greater than 15 inches dbh unless they pose an imminent threat to personnel.
- Where these fuel treatments and spotted owl protected activity centers overlap (305 acres), cut and pile brush and small trees (less than six inches dbh).
- After the felling and piling, use jackpot burning and pile burning to reduce fuel loading.
- Where these fuel treatments and fisher den site buffers overlap (approximately 45 acres), use only pile and burn methods.

Mitigation Measures Common to All Action Alternatives

Mitigation measures were developed following current management direction from the Monument Plan and applicable laws, regulations, and policies. Mitigation measures were also developed to address issues raised during scoping.

Cultural Resources

By using the following mitigation measures, impacts and surface effects on cultural resources from the construction of fuel breaks, fuel treatments, and understory burning would be determined to be "No Effect to Cultural Resources."

1. Proposed undertakings shall avoid historic properties. Avoidance means that no activities associated with undertakings that may affect historic properties, unless specifically identified in stipulations below, shall occur within historic property boundaries, including any defined buffer zones. Portions of undertakings may need to be modified, redesigned, or eliminated to properly avoid historic properties.
2. All historic properties within areas of potential effects (APEs) shall be clearly delineated prior to implementing any associated activities that have the potential to affect historic properties.
   - Historic property boundaries shall be delineated with coded flagging and/or other effective marking.
   - Historic property location and boundary marking information shall be conveyed to appropriate Forest Service administrators or employees responsible for project implementation so that pertinent information can be incorporated into planning and implementation documents, contracts, and permits (e.g., clauses or stipulations in permits or contracts as needed).
3. Buffer zones may be established to ensure added protection where qualified Heritage Program staff determines that they are necessary. The use of buffer zones in avoidance measures may be applicable where setting contributes to property eligibility under 36 CFR 60.4, or where setting may be an important attribute of some types of historic properties (e.g., historic buildings or structures with associated historic landscapes, or traditional cultural properties important to Indians).
   - The size of buffer zones must be determined by qualified Heritage Program staff on case-by-case bases.
   - Landscape architects and qualified Heritage Program staff may be consulted to determine appropriate view sheds for historic resources.
   - Indian tribes, or their designated representatives, and/or Native American Traditional Practitioners shall be consulted when the use or size of protective buffers for Indian traditional cultural properties needs to be determined.
4. When any changes in proposed activities are necessary to avoid historic properties (e.g., project modifications, redesign, or elimination; removing old or confusing project markings or revising maps or changing specifications), these changes shall be completed prior to initiating any project activities.
5. Monitoring by heritage program specialists may be used to enhance the effectiveness of protection measures. The results of any monitoring inspections shall be documented in cultural resources reports and the Infra database.
6. Qualified heritage program staff, in conjunction with fuels, vegetation management, or fire specialists as necessary, shall develop treatment measures for at risk historic properties (as defined in SHPO approved Region 5 modules and agreements) designed to eliminate or reduce potential adverse effects to the extent practicable by utilizing methods that minimize surface

disturbance, and/or by planning project activities in previously disturbed areas or areas lacking cultural features.

- Fire lines or breaks may be constructed off sites to protect at risk historic properties.
- Fire shelter fabric or other protective materials or equipment (e.g., sprinkler systems) may be utilized to protect at risk historic properties.
- Vegetation may be removed and fire lines or breaks may be constructed within sites using hand tools, so long as ground disturbance is minimized and features are avoided, as specified by the qualified Heritage Program staff.
- Fire retardant foam and other wetting agents may be utilized to protect at risk historic properties and in the construction and use of fire lines.
- Surface fuels (e.g., stumps or partially buried logs) on at risk historic properties may be covered with dirt, fire shelter fabric, foam or other wetting agents, or other protective materials to prevent fire from burning into subsurface components and to reduce the duration of heating underneath or near heavy fuels.
- Trees that may impact at risk historic properties should they fall on site features and smolder can be directionally felled away from properties prior to ignition, or prevented from burning by wrapping in fire shelter fabric or treating with fire retardant or wetting agents.
- Vegetation to be burned shall not be piled within the boundaries of historic properties unless locations (e.g., a previously disturbed area) have been specifically approved by qualified Heritage Program staff.
- Fire crews may monitor sites to provide protection as needed.

7. Qualified Heritage Program staff shall determine whether fire, prescribed fire, or treatments within site boundaries shall be monitored, and how such monitoring shall occur.
8. Use of any standard protection measures on historic properties for fire, and hazardous fuels, shall be documented in heritage program reports, detailing equipment type, extraction techniques, conditions of use, environmental conditions, project results, effectiveness of protection measures, need for changes, and recommendations for future use.
9. Felling and removal of hazard, and other trees within historic properties under the following conditions:
   - Trees may be limbed or topped to prevent soil gouging during felling;
   - Felled trees may be removed using only the following techniques: hand bucking, including use of chain saws, and hand carrying, or other non-disturbing, qualified Heritage Program staff-approved methods;
   - and
   - Where monitoring is a condition of approval, its requirements or scheduling procedures should be included in the written approval.
10. Post-project monitoring shall be implemented and qualified Heritage Program staff shall complete in treatment areas where deferred inventory was approved. The qualified Heritage Program staff shall determine the scope and schedule for any additional associated monitoring. Information from any post-project inventory, monitoring, or evaluation shall be used to assess the effectiveness of this non-intensive inventory approach. The results shall be reported in the Forest's Annual PA Report or supplemental report.

Noxious Weeds

Noxious weed infestations are a threat to sensitive plants and their habitats. Mitigations to prevent the introduction and spread of noxious weeds into the proposed treatment areas have been built into the project. These mitigations include:

- Avoiding known infestations during project implementation.
- Using weed free erosion control materials.
- Requiring equipment that operates off-road to be free from weeds and soil before coming into the project area.

Range Management

Build a drift fence along the boundary between the Monument and Reservation, where the fuels reduction activities would create openings for cattle to trespass.

Vegetation

Pull heavy accumulations of fuel away from large giant sequoia trees to prevent mortality during prescribed burning.

Watershed

The following Best Management Practices (BMPs) would be implemented and tailored to meet site-specific needs associated with TRRP Project. Table 2 contains applicable BMPs based on treatment type. Further explanation of each BMP, and where it would be applied, can be found in the Hydrology Report for TRRP (Courter 2014).

Table 2: Applicable Best Management Practices by Treatment Type

	Applicable Best Management Practices										
Units by Treatment	**1.8**	**1.19**	**1.20**	**1.22**	**2.11**	**6.1**	**6.2**	**6.3**	**7.4**	**7.6**	**7.8**
Shaded Fuel Break	X	X	X	X	X	X	X	X	X	X	X
Thinning Planted Stands	X	X	X	X	X	X	X	X	X	X	X
Understory Burns	X	X			X	X	X	X	X	X	X
Other Fuel Treatments*	X	X			X	X	X	X	X	X	X

* Alternative 3 only

1.8 Streamside Management Zone Designation
1.19 Stream Course and Aquatic Protection
1.20 Erosion Control Structure Maintenance *(roads and access to planted stands)*
1.22 Slash Treatment in Sensitive Areas
2.11 Equipment Refueling and Servicing
6.1 Fire and Fuel Management Activities
6.2 Consideration of Water Quality in Formulating Fire Prescriptions
6.3 Protection of Water Quality from Prescribed Burning Effects
7.4 Forest and Hazardous Substance Spill Prevention Control and Countermeasure Plan
7.6 Water Quality Monitoring
7.8 Cumulative Off-site Watershed Effect

Project Design Features for Riparian Conservation Areas and Streamside Management Zones

The intent of the standards and guidelines for Hydrological Resources in the Monument Plan is to manage, improve, and protect streams and their riparian areas while implementing land and resource management activities. In order to reduce fuels in the TRRP project area, field crews would adhere to the following design features to fully meet the intents of the Aquatic Management Strategy and Riparian Conservation Objectives.

Prescriptions for streamside management zones (SMZs) and special aquatic features:

- Do not conduct fuel management activities in SMZs; avoid direct lighting within SMZs.
- Do not remove live riparian vegetation.
- Remove any slash that accidentally enters into an SMZ by hand, and pile and burn it outside of the SMZ.

Prescriptions for Riparian Conservation Areas (RCAs) outside of SMZs:

- Remove small trees and brush during fuel management activities.
- Pile and burn generated slash material.
- Do not place burn piles up against large woody debris or large live trees.
- Retain 10 to 20 tons of large woody debris per acre where present for the benefit of the relictual slender salamander.
- To the fullest extent possible, and with due consideration given for topography, the direction trees are leaning, landings, utility lines, local obstructions, and safety factors, fell trees away from water courses.

Wildlife

Notify the district wildlife biologist should a nest or den site of any TES species become known during project implementation.

Condor activity during implementation phases of the project will be monitored. Should satellite data suggest presence of condors on the Forest that would result in occupation of the TRRP vicinity, a limited operating period will be implemented in consultation with the Condor Recovery Team.

Alternatives Considered and Eliminated from Detailed Study

Federal agencies are required by NEPA to rigorously explore and objectively evaluate all reasonable alternatives, and to briefly discuss the reasons for eliminating any alternatives that were not developed in detail (40 CFR 1502.14). Public comments received on the proposed action during scoping suggested alternatives to achieve the purpose and need. The reasons for not considering these proposals in separate detailed alternatives are discussed in the following paragraphs.

Prescribed burning only

An alternative was suggested to use fire as the only treatment method, except to prepare burning sites. Currently, only 270 acres of the approximately 2,830 acre TRRP project area are in a condition to allow use of prescribed burning by itself, without an unacceptable risk of an escape. The Forest Vegetation Simulator model showed that under current conditions (Alternative 1) fire would spread at a rate of over 10 chains per acre on 57 percent of the project area, and could be a crown fire on over 80 percent of the project area (see the Fire and Fuels section in Chapter 3). The resulting tree mortality and the risk of fire to the Reservation and private lands from crown fire would be unacceptable and would not meet the purpose and need for this project.

Alternative 3, partially responds to this proposal by adding 1,500 acres of prescribed burning after the appropriate preparatory treatments.

Prescribed burning on the lower slopes of Long Canyon leading up to Black Mountain and the Reservation

This alternative was suggested during the second field trip to the area. Prescribed burning in this area could only be done using aerial methods (helicopter) because the area is too steep and remote to safely reduce fuels with any other method. In aerial prescribed burning, there is less control of the fire behavior than with other methods of prescribed burning, and a subsequently higher risk that the fire could escape and spread onto the Reservation. As a result, though more prescribed burning was added to the project (Alternative 3), and both action alternatives propose burning at the top of Long Canyon along the border with the Reservation, an alternative to burn the lower slopes of Long Canyon was eliminated due to the increased risk of an escaped fire.

Treatments on the lower and middle slopes of Long Canyon leading up to Black Mountain and the Reservation

The fire history in this area shows that the most common ignition points are in the lower and middle slopes of Long Canyon below Black Mountain. An alternative was suggested to protect the Reservation by treating fuels on the lower and middle slopes of Long Canyon outside of Black Mountain Grove and its associated mature forest. Treating these slopes of Long Canyon was determined to be infeasible due to the very steep terrain, the remoteness of and lack of roads in the canyon, and the safety concerns for crews working in this environment. In addition, fuels treatments are not as effective when placed in the lower and middle slopes of canyons, because the upper slopes and ridgetops are where firefighters are more often able to catch and control the spread of wildfire.

No snag removal

An alternative was proposed that would allow no snag removal, stating that "snags are a critical component of forest ecosystems" and "as many snags as possible" must be retained to comply with the "protective intent of the Proclamation." Each of the alternatives considered in detail respond to this proposal by limiting snag removal from the Monument. The action alternatives propose to leave all snags standing except those that pose an imminent threat to personnel or lost during prescribed burning operations. Snags felled for this reason would be left on the ground to meet down woody material requirements or, if those standards are met, piled and burned.

Masticate instead of cutting and piling

An alternative was suggested to use mastication as a treatment method rather than cutting and piling. Mastication of shrubs and small trees can cost less and treat more acres than cutting and piling over the same amount of time. However, further analysis for the TRRP Project indicated that more than half of the project area is too steep to use the equipment needed for mastication, and there would be little cost savings compared to cutting and piling. Therefore, this alternative would only partially meet the purpose and need for this project.

Sell merchantable-sized trees as sawlogs

An alternative was suggested to sell trees of merchantable size that are felled in fuel treatment activities in order to offset the costs of the project. Though the Monument Plan does not prohibit this action, Alternatives 2 and 3 both propose to retain all live trees greater than 12 inches dbh, and all snags greater than 15 inches dbh, unless they pose a safety hazard. The trees that would be felled are overtopped and suppressed understory trees. Their value as sawlogs would be less than the cost of hauling them to a mill. An alternative that sold trees larger than 12 inches dbh would be outside the scope of the TRRP Project.

Utilize vegetative material (biomass, fuelwood, minor forest products)

Alternatives were suggested to sell forest products, including biomass, chips, fuelwood, or minor forest products, to offset project costs and reduce air quality effects from burning. Alternatives 2 and 3 both allow removal of some of the down woody material from fuels reduction under the terms and conditions of fuelwood permits. There is currently no stable market for biomass or chips.

Repair or decommission specific roads

Alternatives were suggested to either decommission specific roads, or require road maintenance and dust abatement during project implementation. Decommissioning roads is outside the scope of the TRRP Project and will not be considered in detail. However, in compliance with Forest Service Handbook direction (USDA 2011a, FSH 7709), the forest transportation system would be maintained as part of this project under all alternatives, where necessary and as feasible. A proposal is currently being initiated, as a separate project, to decommission or convert some sections of the roads in the TRRP project area to non-motorized trails.

Comparison of Alternatives

This section compares the alternatives by summarizing key differences between them. They are compared here by treatment acres, by how they respond to the issues, and by their environmental effects. Table 3 compares the acres of treatments by alternative.

Table 3 Comparison of Alternatives by Treatment Acres

Treatment Areas	Alternative (Acres)[a]		
	1	2	3
Planted Stands	0	400	400
Shaded Fuel Breaks	0	730	690
Understory Burn	0	280	240
Other Fuel Treatments [b]	0	0	1,500
Total Area Treated	0	1,410	2,830

[a] All area figures are rounded to the nearest 10 acres.
[b] These treatments include underburning (an estimated 1,456 acres), and piling and burning (an estimated 46 acres).

Table 4 compares the alternatives by how they address the issues, using the key indicators for each issue.

Table 4 Comparison of Alternatives by Issues (Indicator)

Issue	Key Indicator	Alternative		
		1	2	3
Abundance of Snags	Average number of snags per acre	24	18	8
Woody Debris Concentrations	Fire behavior [a]: Surface/ Passive/Active crown fire (percent)	14/68/17	55/34/10	95/4/1
Private Land	Acres of fuel reduction treatments (between private land and Reservation)	None	Some	All

[a] Fire behavior ratings are based on 5-10 years post treatment.

Table 5 Comparison of Alternatives by Environmental Effects

Resource Area	Unit of Measure	Alternative		
		1	2	3
Wildlife Habitat: California Spotted Owl	PAC[a]/ HRCA[b] Treatment Range (acres)	0/0	0-63/ 0-54	0-267/ 0-257
	Average change in PAC/HRCA CWHR[d] Score without/with wildfire [e]	PAC 0.833/ 0.418	PAC 0.850/ 0.438	PAC 0.850/ 0.438
		HRCA 0.810/ 0.367	HRCA 0.807/ 0.418	HRCA 0.816/ 0.500
Wildlife Habitat: Northern Goshawk	PAC/PFA[c] Treatment Range (acres)	0/0	0/42-88	0/67-152
	Average change in PAC/PFA CWHR Score without/with wildfire	PAC 0.960/ 0.586	PAC 0.960/ 0.586	PAC 0.960/ 0.586
		PFA 0.923/ 0.523	PFA 0.923/ 0.560	PFA 0.932/ 0.624
Wildlife Habitat: Pacific Fisher	Den Buffer area Treated (acres)	0	80	125
	Den Buffer without/with wildfire (CWHR Score)	0.76/0.35	0.75/0.56	0.75/0.61
Air Quality (from wildfire or prescribed burning)	Net smoke particles emitted (total tons)	11,076	23,970	50,940
Air Quality (from wildfire or prescribed burning)	Estimated net PM_{10}	1,356.8	93.5	198.7

[a] PAC=Protected Activity Center
[b] HRCA=Home Range Core Area
[c] PFA=Post-fledgling Family Area
[d] CWHR=California Wildlife Habitat Relationship System (Mayer and Laudenslayer, 1988) describes wildlife habitat according to tree size (number) and total canopy cover (letter). The codes 4M, 4D, 5M, and 5D represent vegetation with a mean tree diameter at breast height of at least 12 inches and canopy cover of at least 40 percent.
[e] See effects discussion on pages 148-156 for further explanation.

There are several factors to consider in adequately comparing the effects of the various alternatives. The main factor to consider in comparing alternatives is the purpose and need to protect the Tule River Indian Reservation. The data on fire behavior and treatment areas in Table 3 clearly display that Alternative 3 would best reduce the potential for active crown fire, in part by treating accumulated fuels on an additional 1,500 acres of NFS lands along the boundary with the Reservation.

As shown in Table 4, regarding woody debris accumulations and protecting adjacent private lands, Alternative 3 has the greatest potential of the three alternatives to break up fuel concentrations and protect the private lands close to the project area, by reducing fuels in the wildland urban intermix (WUI) surrounding these tracts. Alternative 2 would reduce the accumulated woody debris to a lesser degree and, in doing so would provide more protection to adjacent land owners and tribal lands than Alternative 1.

In response to the issue regarding snags both as wildlife habitat and a safety hazard, Table 4 shows that each alternative is likely to retain more snags per acre than required for wildlife habitat by the Monument Plan. However, both action alternatives (Alternatives 2 and 3) include the stipulation that snags or live trees that pose a safety hazard may be felled when clearly needed for firefighter or public safety.

As shown in Table 5, canopy cover in the more mature and dense forest habitat types would be retained best in Alternative 3, and least in Alternative 1. In terms of wildlife habitat, though Alternatives 2 and 3 propose treatments in close proximity to known nesting and denning areas, the overall changes in CWHR habitat scores would be minimal in the event of a wildfire occurring after project implementation.

Chapter 3: Affected Environment

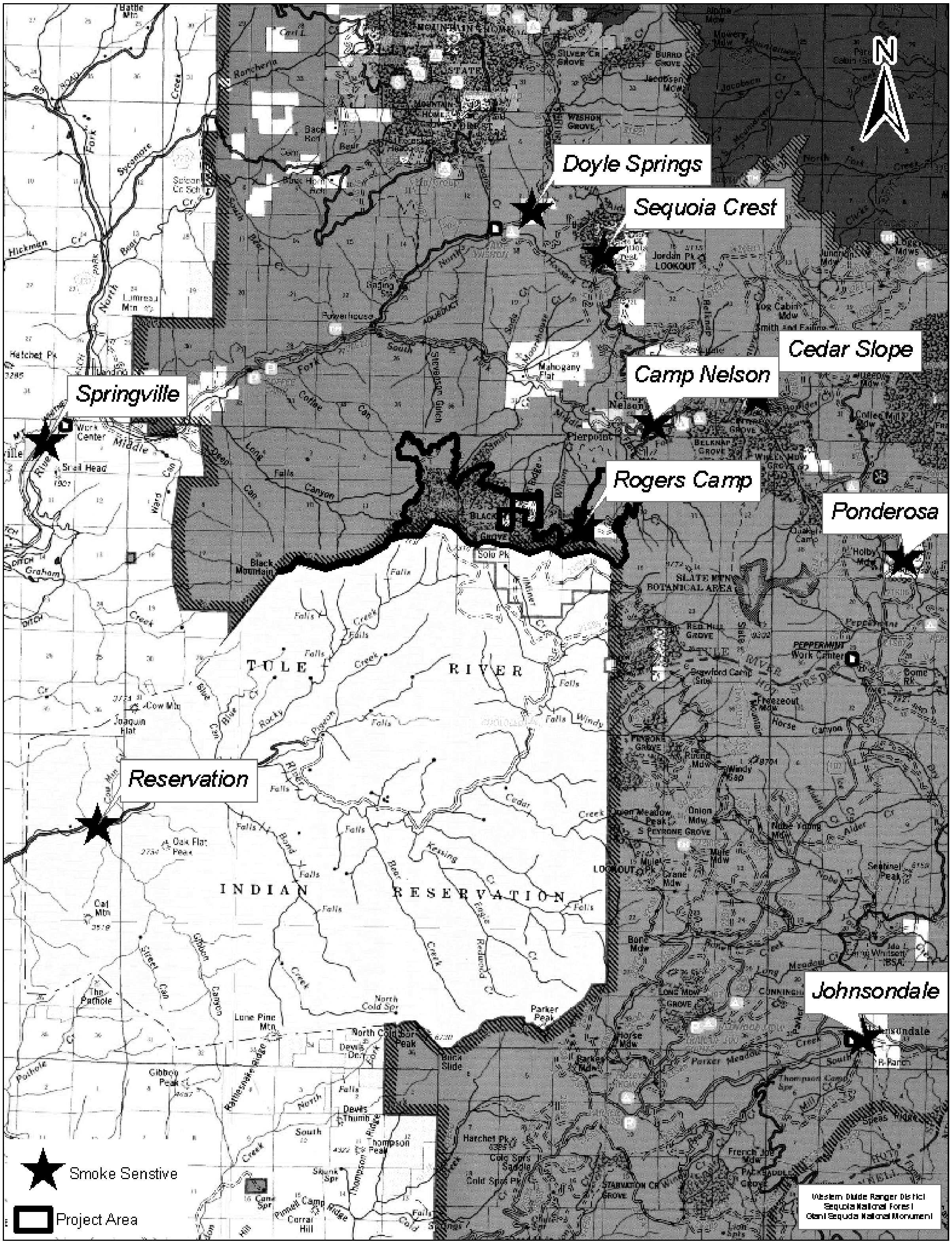
Air Quality

According to the *Tule River Reservation Protection Project Fire, Fuels, and Air Quality Report* (Fire and Air Quality Report) (Ernst 2014) the entire project area lies within the San Joaquin Valley Air Pollution Control District (SJVAPCD) boundaries for Tulare County. Table 6 lists smoke sensitive areas that are near the project area. Their locations are displayed in Figure 4. Wind patterns in this area are generally up and down slope winds associated with the Tule River drainage system (diurnal winds), which are affected by heating and cooling in the San Joaquin Valley. Cold fronts in the fall and winter affect wind patterns over the project area. Inversions can also trap smoke during the night. Past emission readings from air quality monitoring equipment used during burning operations on the Camp Nelson Project and other prescribed fire projects completed in the past in this general area have not produced significant impacts to smoke sensitive areas or exceeded the 24-hour standards.

Table 6: Smoke sensitive areas from the center of the project area in air miles and bearing

Name	Distance (air miles)	Azimuth (degrees)
Rogers Camp	0	243
Camp Nelson	3	214
Doyle Springs	6	169
Springville	10	100
Sequoia Crest	6	188
Cedar Slope	5	233
Ponderosa	7	269
Johnsondale	11	326
Tule River Reservation	8	230

Figure 4: Smoke sensitive areas from the center of the project area



Botanical Resources

The *Biological Assessment for Federally Listed, Threatened, or Endangered Plant Species and Biological Evaluation for Forest Service Sensitive Plant Species and Noxious Weed Assessment* (Botany BA/BE) (Linton 2014) reviewed the proposed Tule River Reservation Protection Project to determine the potential effects on Threatened, Endangered, and Sensitive (TES) plant species. Specifically, the Biological Assessment (BA) documented effects on proposed, threatened, or endangered species and/or critical habitat; and determined whether formal consultation or conference is required with the United States Department of Interior, Fish and Wildlife Service (USFWS), pursuant to the Endangered Species Act. The Biological Evaluation (BE) analyzed effects on Forest Service sensitive plant species in order to determine whether the proposed action would result in a trend toward a sensitive species becoming Federally-listed. The Botany BA/BE was prepared in compliance with standards and direction established in Forest Service Manual 2670.3 and 2672.42 (USDA 2005b) and conforms with legal requirements set forth under Section 7 of the Endangered Species Act (19 U.S.C. 1536 (c), 50 CFR 402.12 (f) and 402.14 (c).

The latest available update of CDFG's database program *RAREFIND 3* (CNDDB, 2013) (USDI 2013a) was used to retrieve Natural Diversity Data Base (NDDB) records for *Special Plants List* species listed for the U.S. Geological Survey quadrangle maps included in Tule River Reservation Protection Project area. Potential habitat and likelihood of occurrence were determined by established habitat parameters of elevation, soil, slope, aspect, and associated plant communities, as well as proximity to locations of known species' occurrences and watershed boundaries.

Vegetation communities within the TRRP project area are dominated by Giant Sequoia Grove, Upper Mixed Conifer Forest (white fir, Jeffery pine) and Sierran Mixed Hardwood Forest (black oak, canyon live oak). The bedrock in this area is predominately derived from a mixture of granitic plutons with a small amount of metamorphic roof pendant. The project area topography is characterized by moderate mid-slopes and relatively gentle ridgetops.

TES Species were eliminated from further consideration if: 1) they had no known occurrences in or near the project area; and/or 2) no potential habitat existed in the project area.

The Sequoia National Forest (Sequoia NF) currently has two plant species federally listed by the USFWS and 58 species designated as Forest Service (FS) sensitive (See Appendix A of the Botany BA/BE).

Consultation to date for Threatened or Endangered Botanical Species

No federally-proposed or -listed plant species are expected to occur in the TRRP project area. Pursuant to 50 CFR 402.12, the USDI Fish and Wildlife Service (USFWS) shows which federally listed, proposed, or candidate species might be affected by projects in the Sequoia National Forest. The species list for the Sequoia National Forest is also updated online from the USFWS, Sacramento Field Office web site on a project-by-project basis and every 90 days. The list was updated June 2013 and is reflected in Appendix A of the Botany BA/BE. The list contains six plant species that occur or may occur within the Forest.

Springville clarkia (*Clarkia springvillensis*), is listed by the FWS as threatened, and is restricted to the foothills of the lower Tule River drainage. Bakersfield cactus (*Optunia basilaris* var. *treleasei*), is listed by the FWS as threatened. It is endemic to a limited area of central Kern County in the vicinity of Bakersfield. California jewelflower (*Caulanthus californicus*), San Joaquin woolly-threads (*Monolopia congdonii*), San Joaquin adobe sunburst (*Pseudobahia peirsonii*), and Keck's checker-mallow (*Sidalcea keckii*) are federally listed, and are known to occur below and outside the western boundary of the Forest, at much lower elevations. There is neither potential habitat nor likelihood for these species to exist within the analysis area for the Tule River Reservation Protection Project. Therefore, they were eliminated from further consideration, and preparation of a formal biological assessment (BA) is not required.

Forest Service Sensitive Plant Species

The analysis area has known populations of the following Forest Service Sensitive plant species:

- Unexpected Larkspur*, (Delphinium inopinum)*
- Shirley Meadow Star-Tulip (*Calochortus westonii*)

The analysis area also has potential habitat for the following FS Sensitive plant species:

- Tulare Cryptantha (*Cryptantha incana*)
- Kaweah Fawn Lily (*Erythronium pusaterii*)

Appendix A of the Botany BA/BE describes the rationale for dismissing specific sensitive plants from further analysis in the TRRP Project.

Beyond threatened, endangered, sensitive and proposed (TESP) plants, the Forest maintains a “Watch list” of plants of local concern that are not on the Regional sensitive species list. The watch list may include plants on various California State or California Native Plant Society (CNPS) lists or may be added due to local rarity, human impacts (such as collection), location at the edge of their range, or other reasons. Generally the potential for watch list plants to occur in a proposed analysis area would not necessitate botanical surveys, but they are inventoried incidentally, while performing sensitive plant surveys on Sequoia National Forest.

None of the action alternatives includes the use of mechanical ground disturbing equipment, so the potential for moderate to severe surface soil disturbance is very low. All wet meadow and riparian areas are excluded from treatment. Because the potential for soil disturbance is low, project specific surveys are not needed, and not required by Forest Service Manual or Handbook direction. Surveys for sensitive plants have been conducted in the past.

Species Accounts for Species Found in the Project Area:

Unexpected Larkspur (*Delphinium inopinum*)

Abundance: *Delphinium inopinum* has 32 reported occurrences, containing from approximately 10 to 100 plants in the smaller occurrences to (more often) 100s or 1,000s in the larger colonies.

Range/Distribution: *Delphinium inopinum* is found in disjunct populations mostly in the Sequoia NF (the majority on the Monarch Divide, Slate Mountain, and the Piutes), the Sierra NF (Monarch Divide), as well as in Sequoia NP and on BLM land (near Lamont Peak), from Fresno County through Tulare, Inyo, and Kern Counties.

Trend: Unknown, assumed stable.

Protection of Occurrences: Some of the large colonies in the Slate Mountain complex are within the Slate Mountain Botanical Area, but no specific protection measures have been established, other than management as a current sensitive species.

Threat(s): The Summit National Recreation Trail (31E14) runs through the middle of the Slate Mountain colonies, putting them at some risk of adverse impact from 2-wheeled motorized and non-motorized traffic. Past and potential proposed recreation projects and timber sales on Slate Mountain have also created potential threats requiring special management.

Fragility/habitat specificity: *Delphinium inopinum* inhabits dry, rock outcrops and open, rocky ridges in pine and red fir forests, at approximately 6,000 to 8,800 feet in elevation. It is often found in association with FS sensitive species *Eriogonum twisselmannii*, *E. breedlovei* var. *breedlovei*, and *Oreonana purpurascens*. The saddle along the top of Slate Mountain habitat may be vulnerable to disturbance.

Shirley Meadows Star Tulip (*Calochortus westonii*)

Abundance: There are over 1,200 acres of known habitat. Specific occurrences may fluctuate, depending on varying habitat conditions. At least 20 to 30 extant occurrences are currently known, most with dozens to thousands of plants each.

Range/Distribution: Currently the known range is approximately 50 miles (north-south) by 16 miles (east-west) in the Tule River and Kern River drainages of Tulare and Kern Counties, respectively. Occurrences may be either small, apparently isolated pockets of plants or large, contiguous colonies scattered from as far north and west as Case Mountain, to just below Mountain Home State Forest and the Camp Nelson area, to as far east as Baker Point Road and the Vincent/Dry/Tyler Meadows area, to as far south as the type locality at Shirley Meadows and Cooks Peak and a short distance below. The Case Mountain population(s) is on BLM land, and a few tracts of private land within Sequoia National Forest include occurrences of *Calochortus westonii*. The majority of populations and habitat, however, exist on NFS lands (Sequoia NF).

Trend: Unknown; presumably stable. *Calochortus westonii* was initially thought to be a highly localized endemic of the area around Shirley Peak in the Greenhorn Mountains after it was collected and tentatively identified in 1927. In 1984, a Species Management Guide was developed to provide protection primarily in relation to timber harvest and ensure long-term conservation of the species (USDI 1984a). Five more occurrences were discovered in 1990 approximately 10 miles to the north just before a large wildfire burned over 2,400 acres throughout much of the area. Approximately 115 acres of additional occurrences were found throughout the burned area during post-fire surveys (1991), and were flagged and excluded from salvage timber harvest, according to a 1990 agreement with USFWS. Many of those occurrences did not persist, however, in subsequent post-fire years in burned habitat in which ecological conditions were not suitable for the species. Occurrences have been found in many areas north of the burn since then (1992-1996). Populations appear to be able to tolerate moderate disturbance (the species is a bulbiferous, perennial herb), and have the potential to colonize new sites when habitat conditions are suitable.

Protection of Occurrences: Since 1990, the USFS has implemented a "flag and avoid" policy for *Calochortus westonii*, according to an agreement with the USFWS. The 1984 Species Management Guide was updated in 1997 to incorporate new demographic information and propose similar (and additional) land management recommendations for enhancing suitable habitat, and protecting and promoting the species.

Threats: Timber harvest and related activities (potential), over-grazing, off road vehicles, competition from larger, more "aggressive" species.

Fragility/habitat specificity: Habitat for *Calochortus westonii* is typically partially open, mixed conifer/black oak and associated dry meadow edges, from approximately 5,000 to 7,200 feet elevation. Soils may be granitic or metamorphic and are moderately loamy and deep when occurring in or adjacent to meadows and dry out early in the season. They may also be somewhat shallower and rockier on steeper forest slopes (usually less than 40 percent slope).

Species with potential to be found in the Project Area but which were not found in Past Surveys

Kaweah Fawn Lily (*Erythronium pusaterii*)

Abundance: Seven occurrences known, most with at least several hundred to several thousand plants each.

Range/Distribution: Range extending roughly 18 miles (north-south) in Tulare County from the Kaweah River watershed in Sequoia and Kings Canyon National Parks down through the Tule River watershed in Sequoia National Forest. Known locations include Hocket Lakes in Sequoia National Park, and Moses Mountain, Jordan Peak, Slate Mountain on the Sequoia National Forest.

Trend: Trend is stable to increasing.

Protection of Occurrences: Most occurrences are protected by the inaccessibility of the steep, rocky habitat.

Threats: None anticipated, due to the inaccessibility of the steep, rocky habitat.

Fragility/habitat specificity: *Erythronium pusaterii* is found in dry, rocky, granitic or metamorphic soils, rock outcrops, ledges, and steep canyon walls of upper montane conifer (fir-pine) forests, approximately 7,300 to 9,100 feet elevation.

Tulare Cryptantha (*Cryptantha incana*)

Abundance: Only 3 occurrences listed in CNDDB, all of which are historical. No information on population size.

Range/Distribution: Southwestern Kern Plateau. Three known locations: 1) 5,800 foot elevation on Ninemile Ck, 2) Grey Meadow, 3) Upper Peppermint Creek (Kern Plateau). The Ninemile Creek occurrence is on Inyo National Forest, and the others are on the Sequoia National Forest.

Trend: Unknown

Protection of Occurrences: The Ninemile Creek occurrence is in National Forest Wilderness.

Threats: Unknown

Fragility/habitat specificity: Lower montane coniferous forest (gravelly or rocky); pinyon woodland (5,800-7,440 feet elevation).

Cultural Resources

Cultural resources are an object or definite location of human activity, occupation, or use identifiable through field survey, historical documentation, or oral evidence. Cultural resources are prehistoric, historic, archaeological, or architectural sites, structures, places, or objects and traditional cultural properties (FSM2360.5). These resources are not mutually exclusive and can oftentimes overlap either in time and space (e.g., an historic building on a prehistoric archaeological site). Descriptions of each type can be found in the *Tule River Reservation Protection Project Specialist Report: Cultural Resources and Tribal and Native American Interests* (Cultural Resources Report) (Gassaway 2014), which is in the project record.

Cultural Resources are protected under the Organic Act of 1897 (Title 16, United States Code (U.S.C.), section 473-478, 479-482, 551), Antiquities Act of 1906 (16 U.S.C. 431), Historic Sites Act of 1935 (16 U.S.C. 461), National Historic Preservation Act of 1966, as amended (NHPA) (16 U.S.C. 470) and its implementing regulation 36 CFR 800, National Environmental Policy Act of 1969

(NEPA) (42 U.S.C. 4321-4346), Archeological and Historic Preservation Act of 1974 (AHPA) (16 U.S.C. 469), Federal Land Policy and Management Act of 1976 (FLPMA), (43 U.S.C. 1701), National Forest Management Act of 1976 (NFMA) (16 U.S.C. 1600), Archaeological Resources Protection Act of 1979 as amended (ARPA) (16 U.S.C. 47Oaa et seq.) as implemented by 36 CFR part 296, Native American Graves Protection and Repatriation Act of 1990 as amended (NAGPRA) (25 U.S.C. 3001) as implemented by 43 CFR part 10, Subpart B – Human Remains, Funerary Objects, Sacred Objects, or objects of Cultural Patrimony From Federal or Tribal Lands, Federal Lands Recreation Enhancement Act of December 8, 2004, (REA) (16 U.S.C. 6801-6814), Executive Order 11593 - Protection and Enhancement of the Cultural Environment, issued May 13, 1971, Executive Order 13007 - Indian Sacred Sites, issued May 24, 1996, Executive Order 13175 – Consultation and Coordination with Indian Tribal Governments, issued November 6, 2000, and Executive Order 13287 – Preserve America, issued March 3, 2003. In addition archaeological collections are managed by Curation of Federally-owned and Administered Archaeological Collections, 36 CFR part 79.

The Forest Service implements these laws and regulations through Forest Service Manual 2300, Chapter 2360, Heritage Program Management as described in Chapter 1 of this EIS. In addition the Sequoia National Forest conducts 36 CFR 800 pursuant to the *Programmatic Agreement Among the U.S.D.A. Forest Service, Pacific Southwest Region (Region 5), California State Historic Preservation Officer, Nevada State Historic Preservation Officer, And the Advisory Council on Historic Preservation Regarding the Processes for Compliance With Section 106 of the National Historic Preservation Act For Management of Historic Properties by the National Forests of the Pacific Southwest Region* (Regional PA) (USDA 2013).

Affected Environment

The types and distribution of cultural resources in the TRRP Project are determined by what, where, why, and how people of the past used the land. An overview of prehistoric and historic land use patterns and how that is manifested in currently known cultural resources is presented below.

Our knowledge of cultural resources in the TRRP project area is derived from eleven archaeological surveys, see Table 7, and ten archaeological sites recorded within the Area of Potential Effect, see Table 8.

Table 7: Surveys in TRRP Area of Potential Effect

Survey Number	Protocol [a]	Survey Name	Author [b]
R1980051352009	SI, SG	Crawford Road Project	FSA
R1982051352001	SI	Rogers Special Salvage Timber Sale	PARA
R1983051352001	SI, SG, SC	Solo Timber Sale	CT
R1986051352002	SI	Black WDTH SSTS	PARA
R1988051353013	SC	CR Survey of Junction, Red, Nelson, and Freeman Timber Sales	CT
R1989051352004	SI	Red Helicopter Timber Sale	FSA
R1991051352009	SI, SG	Red Hill Timber Sale Addendum	FSA
R1991051352010	SG, SC	Rogers Camp Salvage Area	CT
R1991051353001	SI	Slate Special Salvage Timber Sale	FSA
R1994051352005	SI	Tule River and Hot Springs Roadside Hazard Tree Removal	FSA
R2010051352029	SI, SG, SC	Tule River Reservation Protection Project	CT

[a] Protocols include Site Inventory-SI, Survey Grade-SG, and Survey Crew-SC
[b] Authors include Forest Service Archaeologist: FSA, Para-archaeologist: PARA, and Contract Archaeologist: CT.

The Tule River Reservation Protection project area currently has ten recorded archaeological sites. These sites are the physical remains of human occupation over the last 9,000 years and range from small-scale obsidian flake scatters to large-scale complex Native American village sites occupied for thousands of years. Historic sites chronicle some of the earliest Euro-American exploration, settlement, and development of the southern Sierra Nevada. Historic sites in this part of California date from roughly 1850 to the 1960s. The ten prehistoric and historic archaeological sites shown in Table 6 reflect early settlement, use, and management of the lands by indigenous people; westward expansion of Euro-American people (as well as Asian, African, and other non-European people) and resource extraction through logging.

Table 8: Known sites within TRRP Area of Potential Effect

Forest Service Site Number	Type [a]	State Site Number
05135200067	PRE	CA-TUL-562/1029
05135200068	PRE	CA-TUL-1028
05135200138	PRE	CA-TUL-1030
05135200139	HIS	CA-TUL-1026H
05135200191	MUL	CA-TUL-2068H
05135200199	MUL	CA-TUL-1484H
05135200300	HIS	
05135200341	PRE	
05135200342	PRE	
		CA-TUL-3890

[a] Types include prehistoric: PRE, historic: HIS, and multiple periods: MUL

The following discussion of cultural resources is based on the general overview presented in the Giant Sequoia National Monument Specialist Report, Cultural Resources and Tribal and Native American Interests (Gassaway, 2012) and the specific cultural resource research of Theodoratus Cultural Research (1984). Those documents are hereby incorporated by reference.

Prehistoric Background

People first arrived in California more than 13,000 years ago (Johnson et al. 2002). While currently there are no known sites older than 7,000 years old, there is the potential in the GSNM to have some of the oldest sites in the Sierra Nevada; since this portion of the Sierra Nevada was not extensively glaciated during the Tioga glaciation (14,000 years ago). McGuire and Garfinkel (1980, pp. 49-53) defined a sequence of prehistoric phases of settlement for the southern Sierra Nevada. By default this sequence can be used when discussing the TRRP Projects prehistory. These phases of settlement according to McGuire and Garfinkel (1980, pp. 49-53) are as follows, and are described in further detail in the Cultural Resources Report:

- Paleoindian (9,000 to 6,000 B.P.)
- Lamont Phase (6000 to 3200 B.P)
- Canebrake Phase (3200 to 1400 B.P.)
- Sawtooth Phase (1400 to 700 B.P.)
- Chimney Phase (700 BP to historic period)

Ethnography

The Yokut are the ethnolinguistic group whose traditional territories are now within the TRRP Project. The Yokut are a part of a broad ethnolinguistic group that is further divided into tribal groups or triblets. The tribelet was the basic political unit for the ethnographic groups in California (Gayton 1948).

The Yokuts speak dialects of Yokutsan which is a language group in the Penutian language family. The Yokutsan speaking groups are part of a widespread and populous set of peoples occupying the San Joaquin Valley from the Sacramento Delta to the Tehachapis, north and south, and from the east side of the southern Coast Ranges to the Sierra Nevada foothills, east and west. The "Yokutsan" language family is related to several other large central California language families, Wintuan, Maiduan, and Utian. Yokuts languages and dialects are subgrouped into three divisions which correspond only roughly to the environmental zones occupied: Foothill Division, Valley Division, and Buena Vista Division. The Yokuts seem to have been well established in their regions over a significant period of time, certainly in excess of 1,000 years.

The TRRP Project area is the traditional territory of the *Yaudanchi* Yokuts. The *Yaudanchi* had its residential core on the North and Middle Forks of the Tule River at the main winter village of *Shawahtau*. “*Ketilmuh* was a Yaudanchi summer village at Camp Nelson” (Latta 1949:23).

Subsistence and Material Culture

The Yokuts relied on a hunting, fishing and gathering economy. This economy adapted to seasonal change wherein specific resources were targeted based on the season. Spring gathering involved young plants and greens such as clover (*Trifolium* spp.) and yucca blossoms (Yucca L.). Summer, the principal gathering season, brought a diversity of plant foods including varieties of grasses, seeds, tubers and berries. In summer the population of major villages would often divide, departing for temporary camps in the valley and foothills. Late summer provided the most essential storage foods including pine nuts (or piñon nuts) and acorns (Theodoratus Cultural Research 1984).

This economy caused tribelets to have seasonal rounds where "permanent" villages were occupied for the most part in the winter months. During the summer, villages would split into groups of two or three families and travel to summer camps. Although there were no definite tribal boundaries, village sites were regarded as the seat of the tribelet, and territories were confined to hunting and gathering areas. In times of food shortage, adjacent tribes, who maintained friendly relations, shared available resources (Gayton 1930). Winter villages were in the lower elevations where groves of black oaks (*Quercus kelloggii*) grew.

While women were the principal gatherers, men were responsible for fishing and hunting. Fish were obtained by various methods, including poisoning, spearing and trapping with weirs.

A large variety of game animals were readily available and included mule deer, tule elk, antelope, black bear, rabbits and ground squirrels, as well as a variety of birds such as quail, pigeons and waterfowl (Theodoratus Cultural Research 1984). Bows and arrows were used most frequently, but snares and traps were also utilized. Obsidian for arrow points was traded in a rough form from the Great Basin. Spring traps were used to snare rabbits, jays and squirrels. Birds such as quail were shot, not trapped.

A significant part of the economy was trade. The tribes from both sides of the Sierra Nevada traveled across the mountains for trade. Items brought from the east were rock salt, pine nuts, mountain sheep skins, moccasins, buckskin jackets, leggings made of fox skin, rabbit skin blankets, baskets, pine sticks, sinew-backed bows, and unfinished obsidian blanks. Items taken east were beads, acorn meal and baskets. In later times the tribes of the Great Basin desired red beads and Spanish blankets for trade. Shell beads or "money" had derived from the west in the form of slender tubular beads called "humana" beads by the Yokuts and Mono. Also valued were small clamshell discs. These smaller beads were measured around the hand or wrist for their worth as a measure of money.

Native Americans, Vegetation Manipulation, and Fire

Native Americans and the groups that inhabited the area now known as the southern Sierra manipulated the vegetation in order to provide diverse and sustainable food and material supply. This manipulation came in the form of gathering, cutting, sowing, burning, hunting, and limited planting (Anderson 1988). Direct intense hand manipulations would have been limited by population size, distance from habitation sites, and length of occupation. More indirect manipulations, such as fire, would not have had such limits and would have only been limited by the susceptibility of fuels to burn. Fire was used to promote vegetation regeneration, for hunting, to capture insects for food, and for other activities (Blackburn and Anderson 1993; Anderson and Moratto 1996; Lewis 1973; Bean and Lawton 1973). While the extent and scale of environmental impacts from Native American burning has been highly contested between anthropologists and natural scientists (Denevan 1992; Boyd 1999; Vale 2002; Whitlock and Knox, 2002; Lewis and Anderson, 2002; and Anderson, 2005), most scientists agree that within areas of habitation and traditional gathering Native Americans purposefully used fire and had a high degree of impacts. The loss of fire due to disruption of traditional tribal practices, plus subsequent fire suppression, has profoundly changed the forests. Euro-American contact and settlement in the 19th century ended much of the tribal manipulation of the area's ecosystems.

Historical Background

Contact, Missionization, and Mexican Rule

Prior to direct contact between Europeans, and Native American cultures in the Sierra Nevada, Native Americans were impacted by European exploration and settlements outside the region. Europeans brought guns, horses, and diseases which caused catastrophic plagues that decimated the indigenous peoples. These impacts also caused large-scale changes and interruptions in trade and social networks. Diseases brought death and large-scale depopulation which caused fluctuation in tribal boundaries. Horses brought changes in tribal interactions including the horse raiding staged by the Yokuts in the 1820s through 1840s (Phillips 1993).

The first Spanish settlements along the California coast, starting in 1769, heavily impacted the population of coastal Indians, and these effects were also felt by peoples of the San Joaquin Valley and the Sierra foothills. The Spanish did not just stay in a small strip along the coast and by 1776, Spanish missionary Francisco Garces, with a small group of soldiers, explored the eastern San Joaquin Valley visiting the Kern Valley, the White River, and possibly California Hot Springs, including the *Bokninuwad* village of Hoin Tinliu Yokuts (Latta 1977). In 1819, Lt. Estudillo explored the Tule River and Deer Creek in Yokuts territory (Larson 1985, p. 4, Theodoratus Cultural Research 1984). In addition to direct contact with Spanish missionaries, soldiers and settlers, Native American populations also came into contact with "neophytes" (i.e., people newly converted to a belief, as a heathen, heretic, or nonbeliever) who were either released or had run away from the mission system.

The early 1800s brought an increase in American explorers passing through the southern Sierra Nevada including Jedediah Smith, who explored the upper reaches of the Kings and Kaweah Rivers in 1827, Joseph Walker in 1834, and Peter Skene Ogden in 1843 (Farquhar 1966; Hoover et al. 1966, p. 561). Ewing Young noted strong Hudson's Bay Company presence and evidence of a malaria epidemic among the Yokuts with funeral pyres and scattered corpses, between the Kings and San Joaquin Rivers in 1833-34 (Rehart et al. 2007, p. 5). Early mapping efforts of the region included that of John C. Fremont and Joseph Walker in 1845-46. Fremont with Kit Carson explored the upper North Fork of the Kings River and portions of the Tule River (Hoover et al. 1966, p. 561, Larson 1985, p. 11).

Following the Mexican-American War, Mexico ceded California to the United States and it became the 31st state admitted to the union on September 9, 1850. Also in 1850, Lieutenant George H. Derby of the Topographic Engineers traveled up Deer Creek close to California Hot Springs (Larson 1985, p. 12).

The Gold Rush, Native Decline and Reservations

Discovery of gold in the southern Sierra Nevada during the early 1850s brought non-natives to the Greenhorn Mountains and the Kern River valley, south of the Monument. While the majority of miners went North or South of the Monument others used the trails passing through the mountains and caused development of the Jordan Trail, Camp Nelson, Ponderosa, and Mineral King. There were limited "diggings" in the White River area of the Monument.

Native Americans responded to the presence of non-Native miners, explorers, and settlers in a number of ways. The three most common strategies were: 1) they stayed in their traditional area and adapted as needed (somewhat maintaining a traditional lifestyle, or entered the local wage-labor economy working for Euro-American); 2) they fled to areas remote from Euro-American settlements; or 3) they resisted and fought for their territory. These choices were not mutually exclusive or necessarily independent from each other as individuals or tribal groups might do all three throughout their lifetimes or across generations.

The large influx of people into the San Joaquin Valley and Sierra Nevada foothills during the 1850s brought major armed conflicts, including the Mariposa Indian War and the Tule River War which was fought at Battle Mountain near Springville. During the Mariposa Indian War, Company A of the Mariposa Battalion under Captain J. Kuykendall rounded up Native Americans between the Kings and Kaweah rivers. While pursuing “fugitives” towards the headwaters of the ‘Kah-we-ah’ Kuykendall observed “as to this region east and southeast of the termination of our pursuit, I have only this to say, that it is simply ‘indescribable’."

While the governor was sending militia to fight, punish, and bring Native Americans to reservations, President Millard Filmore, in 1851, sent three agents (O. M. Wozencraft, Redick McKee and George W. Barbour) to negotiate treaties with the California tribes. The agents negotiated and signed 18 treaties with representatives of various Native groups including four Yokut groups close to the GSNM – the *Chunut*, *Wowol*, *Koyeti* and *Yowlumne*. The treaties released tribal lands in exchange for reservations and governmental services and supplies (Theodoratus Cultural Research 1984). One of the proposed reservations was the Tulare Lake Reservation to be located between Tulare and Buena Vista Lakes. The proposed Tule Reservation extended from the Tule River south to Paint Creek. The treaty also promised 200 head of beef cattle per year for the next two years (http://www.tulerivertribe-nsn.gov/history). None of these treaties were ever ratified by the U.S. Senate and, thus, the reservation was never formed and no cattle ever given to the tribes.

Subsequently, Congress authorized seven reservations of 25,000 acres each to be set aside. This was considerably less than what was agreed to by the treaties and many reservations were never 25,000 acres. Throughout the 1850s Tribal members were moved from one reservation to another. First Fort Tejon was formed in 1853, then the Tule Farms/River Reservation (also known as Madden Farm) was established in 1856; the Fresno River Reservation was established in 1857. In 1861, both the Fresno and Tule River were combined and moved to the mountains where the Tule River Reservation exists today (Theodoratus Cultural Research 1984).

The shuffling and segregation of Native American people continued when President Ulysses S. Grant issued an executive order on January 9, 1873, establishing the Tule River Indian Reservation at its present location. The new reservation comprised about 48,000 acres but was almost doubled in size on October 3, 1873, when President Grant issued a second executive order resetting the northern boundary to the drainage between the Middle and North Forks of the Tule River. The expanded reservation did not last long when, in 1878, President Rutherford B. Hayes cut the reservation to its original size and returned all the additional land to the public domain (http://www.tulerivertribe-nsn.gov/history).

Emergence of Timber and Grazing

While the area that is now the GSNM was largely left untouched by miners, the Gold Rush left a significant impact on the San Joaquin Valley west of the GSNM. The growth of the Euro-American occupation in the GSNM is closely tied to that of the growth of the eastern San Joaquin Valley. By the mid-1850s the town of Visalia was a major station along the Stockton-Los Angeles and Butterfield Stage Roads, and in 1852 Tulare County was organized. Cattle ranching and timber harvesting quickly spread eastward from Visalia into the foothills and mountains. By the early

1860s, foothill communities like Squaw Valley and Poso Flat were being settled and people were traveling through the area that would become the GSNM on the Dennison, Jordan and Hockett Trails.

By the mid-1850s, the demand for lumber in the valley brought loggers to the mountains. By 1865, James R. Hubbs had established the first sawmill in the Tule River basin. These earliest lumber mills were located in the lower elevations, investments were minor and the operations were small. "In addition, these mills were technologically primitive, compared with the mills soon to follow. These technologies were not restricted to a single type, but they did generally represent low-level stages within the evolution of the sawmill" (Brown and Elling 1981, p. 54). The first sawmills "were always built where they could recover the most wood with the least effort. So, as trees continued to be felled, the sawmill sites moved progressively farther up into the mountains (Larson 1985, p. 58). The mills of this period were mostly owned by individuals or by small partnerships, operating with minimal capital, a small labor force, and served primarily local markets. Mills were "…changing hands, names, owners, and locations very often – so often, in fact, that accounts of this area during this period are often disorganized and confusing…" (Brown and Elling 1981, p. 48). They usually focused on sugar pine or yellow pine and only logged those redwoods in their way.

The expansion of associated settlements into the mountains also took place with the establishment of California Hot Springs by the Witt brothers in 1883 (Muller 1990, p. 1), Pine Flat in 1883, Camp Nelson in 1886, and Springville in 1890.

Expansion of Euro-American populations into the San Joaquin Valley in the late 1800s brought the establishment of new towns including Porterville, Ducor, and Terra Bella and the need for more lumber, thus the growth of the timber industry and mills.

Tourism and Recreational Development

Early recreation in what is today the GSNM began in the 1870s and 1880s with families heading to higher elevations to escape the summer heat of the San Joaquin Valley. Families would explore the backcountry by pack trains, exploring "the old sheep, cattle, mining, and Indian trails". Mountaineering parties began to use the Dennison, Jordan, and Hockett Trails to access Mount Langley and Mount Whitney. (Jackson 2004, p. 65)

Government Management

The area that is now the GSNM, the surrounding Sequoia National Forest, and the Sequoia and Kings Canyon National Parks have been the focus of battling views on how to manage timbered lands and *Sequoiadendron giganteum* since Euro-Americans began utilizing and settling in the area. Differences in opinions of what is the most appropriate management have ranged from exploitation to preservation. These opinions have been manifested in actions from all three branches of the government: Executive, Legislative, and Judicial and has left its mark on the land and in the cultural resources that remain on the landscape.

Past management of what is today the TRRP project is dominated by the private ownership and the Forest Service with the influence of Tule River tribal practices that borders the project area.

Tribal Relations

The TRRP Project was proposed based on a request from the Tule River Indian Tribe under the Tribal Forest Protection Act. Tribal consultation has been on-going and included presentations to the Tule River Tribal Council, and a field trip on July 30, 2012 to review the proposal. No new issues were raised during this trip.

Management of the resources within TRRP Project in terms of cooperation with Native American and Tribal interests is governed by the laws and executive orders applicable to cultural resources, specifically ARPA, NAGPRA, Indian Sacred Sites (EO 13007), and Consultation and Coordination with Indian Tribal Governments (EO 13175).

In addition to the Tribal Forest Protection Act of 2004, other laws potentially applicable to the TRRP Project include the National Indian Forest Resources Management Act (NIFRMA) (Public Law 101-630, November 28, 1990), American Indian Religious Freedom Act (AIRFA) (Public Law 103-344, October 6, 1994), Healthy Forest Restoration Act (HFRA) (Section 303 of Public Law 108-148, December 3, 2003), and the Farm Bill: Food, Conservation, and Energy Act of 2008 (Public Law 110-234).

Tribal consultation is also guided by Executive Memos for "Government-to-Government Relationship" (April 29, 1994; September 23, 2004).

The Monument Plan Record of Decision discussed how the strategies for fuels reduction and creation of the tribal fuels emphasis treatment area (TFETA) were in response to concerns raised by the Tule River Indian Tribe:

> The TFETA was developed in response to discussions with the Tule River Indian Tribe and their concern over fires spreading to the Tule River Indian Reservation. The Tule River Indian Tribe of California is a federally recognized tribe, and as such it is the policy of the USDA to consult and coordinate with them on a government-to-government basis in compliance with Executive Order 13175 (Consultation and Coordination with Indian Tribal Governments) prior to making a decision. This land allocation was designed along the boundary with the Tule River Indian Reservation to not only protect the reservation and its watersheds, but also the objects of interest and watersheds in the Monument, from fires spreading from one to the other (Monument Plan Record of Decision, p. 15)

Tribal and Native American Interests

Native Americans and Alaska Natives are recognized as people with distinct cultures and traditional values. Historically, Native Americans have cared for and occupied lands that are currently being administered by the United States government. They have a special and unique legal and political relationship with the government of the United States as defined by history, treaties, statutes, executive orders, court decisions, and the U.S. Constitution. Tribal governments have jurisdictional powers that are frequently separate and equal to those of state and local governments. The policy of the U.S. Government is to support Native American cultural and political integrity, emphasizing self-determination and government-to-government relationships. This support comes from implementing and following laws aimed at protecting tribal rights and religious beliefs. The AIRFA, ARPA, NHPA, E.O. 13175, and others all charge the federal government with protecting areas within public lands that are sacred to native peoples. In addition there are many Forest Service policies, including but not limited to FSM 1560, the Traditional Gathering Policy, to help and assist with tribal relations between the Forest Service and tribal communities.

There are many rights and privileges associated with treaties, executive orders, and other agreements, such as grazing, hunting, subsistence gathering, and access to and gathering of national forest resources. In addition, land and resources hold a special and unique meaning in the spiritual and everyday lifeways of many Native Americans.

The Sequoia National Forest remains committed to cultivating good relationships with Native American tribes and Native American groups. National Forest System lands and resources represent significant cultural and economic values to Native Americans. The Forest Supervisor has the responsibility to maintain a government-to-government relationship with federally-recognized Indian tribes. He also ensures that forest programs and activities honor Indian treaty rights and executive orders, and fulfill trust responsibilities, as those responsibilities apply to National Forest System lands. Treaties, statutes, and executive orders often reserve off-reservation rights and address traditional interests relative to the use of federal lands. The Forest Supervisor also administers programs and activities to address and be sensitive to traditional native religious beliefs and practices and provide research, transfer of technology and technical assistance to tribal governments. The Sequoia also confers with non-federally recognized tribes, organizations and individuals.

Currently, the Sequoia has one agreement in place with Native American tribes concerning Sequoia National Forest Protocol for the Inadvertent Discovery and Identification of Native American Human Remains, Funerary Objects, Sacred Objects and Objects of Cultural Patrimony, that applies equally to federally and non-federally recognized tribes.

The Western Divide Ranger District borders over one-half of the entire Tule River Reservation (See Figure 1). Approximately 9,000 acres of the upper portion of the South Fork Tule River, to which the Tule River Tribe has water rights under the Winters Doctrine, are within the Monument. The Winters Doctrine established that when the federal government created Indian reservations, water rights were reserved in sufficient quantity to meet the purposes for which the reservation was established. Water rights affect over 1,500 residents of the Tule River Indian Reservation.

Contemporary uses or concerns have centered on the protection of the Reservation through the reduction of the threat of wildfire spreading to or from National Forest System lands and Reservation lands; and the protection of and access to forest resources of cultural or traditional importance and areas with special or sacred values, often the locales of ceremonial activities. These include access and use of Forest Service roads that access reservation land, and protection of the Tule River watershed.

The Tule River Indian Tribe has a deep emotional, symbolic, and spiritual meanings for those areas that are their traditional lands, including those lands that are publicly owned and managed by Sequoia National Forest. In a general view, these perceptions and meanings influence their current lifestyles, environment, and quality of life (McAvoy et al. 2001). Researchers also have noted that the dominant society's (in this case, Anglo-Hispanic) sense of place often conflicts and competes with the minority people's (Native Americans) sense of place, resulting in different realities or "contested terrain" that present challenges for public land management agencies (McAvoy et al. 2001).

On November 1, 2005, the Tule Council formally submitted the “Tule River Reservation Protection Project” (TRRPP) to Art Gaffrey, SQF Supervisor. The proposal identified threats from Forest Service lands to adjacent Tribal lands and the reservation community, particularly wildfire, insects and disease. On November 23, 2005 Bernard Weingardt, Regional Forester for the Pacific Southwest Region, submitted a letter of support to Forest Supervisor Gaffrey regarding TRRPP.

In 2011 the forest entered into a *Memorandum of Understanding between the Tule River Indian Tribe and the USDA, Forest Service, Pacific Southwest Region, Sequoia National* Forest (FS Agreement No. 11-MU-11051352-039) (USDA 2011b), that formally recognized the mutual interest in reducing the threat of wildfire spreading to or from National Forest System lands and Reservation Lands. One of the objectives of this MOU is for both parties to assist in development of projects to achieve mutual goals of community and resource protection.

Fire and Fuels

The *Tule River Reservation Protection Project Fire, Fuels, and Air Quality Report* (Fire and Air Quality Report) (Ernst 2014) describes the existing conditions, in terms of fuel and fire behavior, and compares them to post treatment conditions for the two action alternatives. It shows the effectiveness of the fuel treatments in terms of fire activity, flame lengths, rates of spread, and firefighting suppression efforts.

Fire History / Fire Return Interval

Research in the Giant Forest of the Sequoia and Kings Canyon National Parks, adjacent to the Sequoia National Forest, shows that over three millennia during the warmest and driest periods, the fire return interval was the shortest (Swetnam et al. 2009). Fire-scar studies in giant sequoia groves in Yosemite National Park, Sequoia and Kings Canyon National Parks, and Mountain Home Demonstration State Forest, suggest that mean fire return intervals were as low as 2.5–3 years for more than 1,300 years from AD 500–AD 1875. Occasionally, fire-free intervals of 20–30 years occurred in the record (Swetnam et al. 1992; Swetnam 1993). At Cedar Slope only three air miles from the project area, preliminary research by students from Penn State University indicates that the area burned on an average of every 5 years prior to 1910. In the same study, fire scar data collected from the Freeman Creek Grove and the Long Meadow Grove shows a similar frequency of burning. These areas are within 10 air miles of this project's location (Taylor, unpublished data, 2007).

Sequoia National Forest fire history and ignition records for the last 100 years have recorded 11 fires that originated inside the project area, all of which remained at less than 10 acres (Table 9).

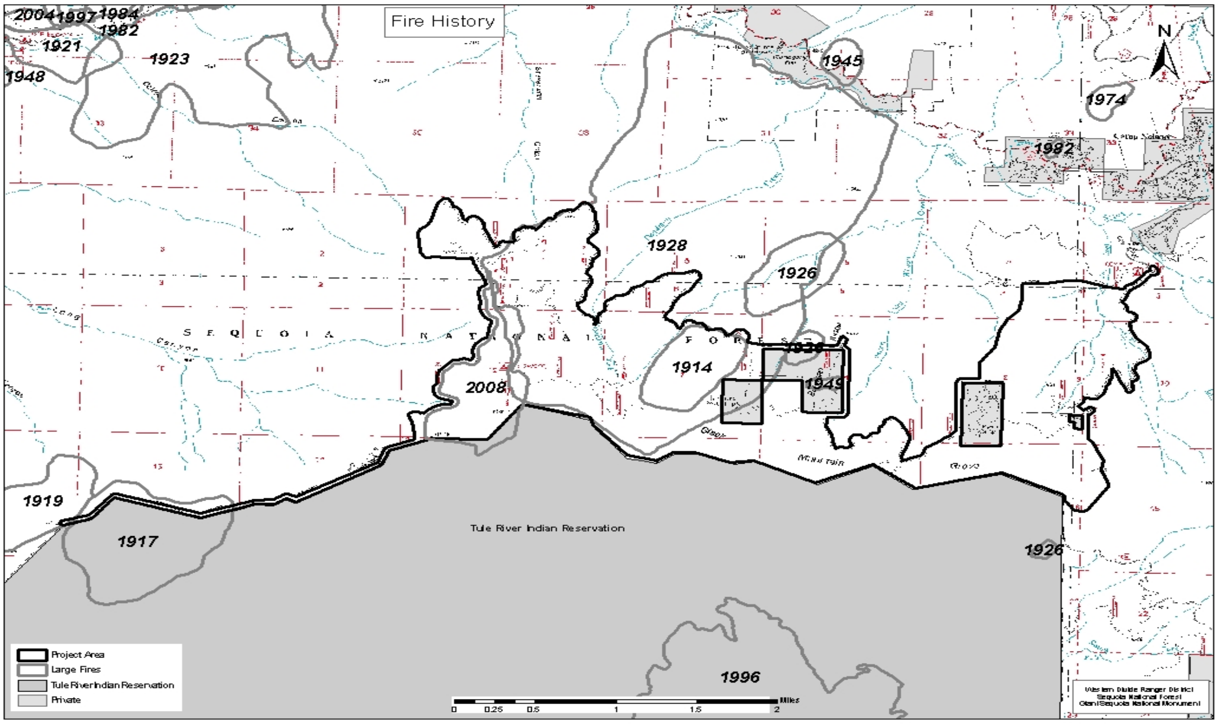
Table 9: Fire history of the project and surrounding area

Year	1913	1914*	1916	1917*	1919*	1924	1926*	1928*	1964	1969	1976	1983	1984	1987	1994	2007	2008*
Acres	<1	182	<1	77	195	2	27	3,052	<1	<1	<1	<1	4	2	<1	<1	275

* Fires that originated outside of the project area

Six fires much larger in size have originated outside the project area and then burned into the project area; the largest fire reaching over 3,000 acres in 1928 (Table 9 and Figure 5). Factors contributing to these larger size fires appear to be steep inaccessible slopes combined with heavy fuel loading. For fires that originate below the project area, these factors align for extreme uphill fire behavior and large fire growth. These areas also lack safety zones and escape routes for firefighter safety.

Figure 5: TRRP Project Area Fire History (for fires larger than 10 acres)



The majority of the fires that have affected this area occurred within the Middle Fork Tule River drainage north and west of the project area. Several other fires have occurred in the South Fork of the Middle Fork (SFMF) Tule River drainage which lies immediately north of the project area. The 1928 fire burned from the confluence of Moorehouse Creek and the SFMF Tule River up to the ridge separating the Tule River Indian Reservation's north boundary and the Monument. The upper portion of the fire perimeter burned near the central portion of the project area (see Figure2). The next largest fire to burn into the project area occurred in 2008 called the Solo 2 Fire which burned approximately 275 acres in the Monument and a small part of the Reservation near the western end of the project area. The Solo 2 Fire started on the Reservation and burned into the Monument.

The proposed project area and some surrounding areas have deviated from historic fire return intervals of 2.5 to 30 years, primarily due to fire suppression. Former fire and vegetation management has allowed dense stands of trees and shrub to grow, resulting in the current high fuel loading. Areas with high fuel loading often burn unnaturally, with intense fire behavior. The Black Mountain Grove Inventory report found a buildup of fuels at a higher concentration than is expected within the range of natural variability within giant sequoia groves (Jump 2004). By reducing the surface and ladder fuel amounts as proposed, the hazardous fuel loading situation would be mitigated.

Fire history information for the giant sequoia groves is available back to 1910 and there are areas within the Black Mountain Grove that have no record of fire occurrence. Since formal fire records have been kept, only five fires larger than ten acres have burned inside the grove boundary in the Monument (see Table 10 and Figure 5).

Table 10: Fire History in Black Mountain Grove

Fire Year	Cause	Total Fire Size in Acres	Acres of Fire in Grove
1914	Campfire	362	181
1926	Lightning	158	34
1926	Lightning	27	27
1928	Campfire	3,181	1,277
1949	Campfire	10	10

The potential exists for large fires to threaten the Black Mountain Grove if fires burn upslope from Long Canyon or the Middle Fork drainage of the Tule River. There is also the potential for large fires that originate on the Tule River Indian Reservation, in the South Fork drainage of the Tule River, to threaten the grove. Due to the high fuel load and the amount of time that has passed since the last known fires, it is believed that if a fire is established and spreads up the steep slopes and into the grove it could be a stand-replacing event. Such a fire would threaten large giant sequoias, degrade water quality, and damage other resources.

In the last 20 years, 35 of the 146 fires (or 24 percent) in this part of the Monument have started down slope of the Black Mountain Grove to the north or northwest, with the majority starting near Upper and Lower Coffee Camp Day Use Areas and along Highway 190. By chance, all of these fires started north of the Tule River and none crossed the river to the south. With the high amount of summer recreational use, high fuel loading, and the lack of firefighter access, the potential of a large fire south of the river is high. Fires that start in lower Long Canyon are also a concern for the Tule River Tribe. This canyon, located between the lower Tule River and Black Mountain Grove, is a path that fire can follow from the lower slopes south of Coffee Camp, through the grove, and onto Tribal lands (see Figure 1). From 1910 to 1999, 103 of 146, or 70.5 percent, of fires on the Tule River Reservation started down slope of the Black Mountain Grove in the South Fork of the Tule River. One notable fire, the Cholollo Fire, came within ½ mile of the Black Mountain Grove in 1996.

Fuels

The vegetation in the project area is comprised predominately of mixed conifer tree species and other plants associated with the southern Sierra Nevada range. The overstory and understory canopy layers include a mix of conifers, hardwoods and giant sequoias. Understory vegetation is comprised primarily of woody shrubs and forbs including, bear clover, manzanita, white thorn and chinquapin.

The mixed conifer forests within Sierra Nevada Mountains prior to European settlement were thought to be uneven-aged, patchy, broken, and diverse in vegetation. Fire ignited by lightning and Native Americans prevented the accumulation of dead and live fuels that supported unnatural high intensity stand-replacing wildfires (McKevy et al. 1996). Low to moderate intensity fires burned regularly and frequently, favoring fire resistant and dependent species by removing duff, litter and understory plants. However, grazing, logging, mining, recreation and, most importantly, fire suppression have influenced patterns in Sierra Nevada ecosystems over the last century. Little of the higher elevation zones have burned due to effective suppression of the low to moderate intensity fires (Skinner and Chang 1996). One direct consequence of these changes is an increased hazard of wildfires sweeping through groves with a severity that was rarely encountered in pre-Euro-American times (Kilgore and Sando 1975, Stephens 1998).

The lack of fire in the last century has modified the structure of mixed-conifer forests of the southern Sierra Nevada. (Parsons and DeBenedetti 1979, Bonnicksen and Stone 1982). The density of small shade-tolerant trees and high surface fuel loads has increased the hazard of extreme fire behavior (Kilgore, 1973, Van Wagtendonk 1985). The horizontal and vertical fuel continuity has also increased, resulting in forests that are vulnerable to loss and damage (Stephens 1998). Similar situations were found in the Black Mountain Giant Sequoia Grove in 2004 and in 2013 within the perimeter of the project area.

The *Fuel Load Reduction Plan for the Black Mountain Giant Sequoia Grove* (Grove Fuel Plan) (Ernst 2013) indicates that there is a heavy fuel load, coupled with dense ladder fuels, in the Black Mountain Grove that makes the grove at a high risk of loss from a stand-replacing wildfire. Fuel inventories conducted in 2003 found that the Black Mountain Grove is in a declining state of health due to decades of wildfire exclusion. The overstocked stands are causing density-related mortality. The competition for soil moisture, sunlight, and nutrients is resulting in declining tree growth rates and a shift in the species composition away from shade-intolerant species; such as ponderosa pine, sugar pine, and giant sequoia; toward shade-tolerant species; such as white fir (Jump 2004). In 2003, the grove averaged 35 snags (21 tons) per acre and 39 down logs (49 tons) per acre, which is nearly five times the desired amount as described in Jump (2004). About two-thirds of the 35 snags per acre are trees that have died within the past 10 years prior to the inventory. Across all size classes, the fuel loading is currently 92 tons per acre (Table 11). Since the 2003 inventory, shade tolerant tree species have continued to dominate within the grove, leading to even greater fuel loading.

Table 11: Current and Recommended Surface Fuels by Fuel Size Class for the Black Mountain Grove

Fuel Size Class (Inches)	Current[a] (Tons per Acre)	Recommended[b] (Tons per Acre)
Duff	30.1	1-15
0-1	3.1	1-2
1-3	4.4	1-3
3-9	5.0	1-3
>9	49.2	10-20
TOTAL	**91.8**	**14-43**

[a] Current refers to the 2003 inventory conditions.
[b] Recommendation from grove inventory document (Jump 2004)

Weather

The project area is best described as an arid Mediterranean climate with dry summers and cool wet winters. Precipitation averages approximately 30 inches per year with approximately half of this as snowfall.

The weather data that best represents this project area is from the Park Ridge remote automated weather station (RAWS). This RAWS is similar in elevation and has the largest amount of data near this site. The Fire Family Plus 4.0 software program (Bradshaw et al. 2008) was used to determine the 90th percentile weather from 12 years of observations from 1997-2009. Table 12 summarizes the 90th percentile weather at the Park Ridge RAWS. The main influences on fire behavior in this area are the diurnal winds associated with the heating and cooling of the San Joaquin Valley, creating up and down canyon winds. Fire weather is significantly affected by low relative humidity and high temperatures during the summer months and in the fall, by very dry easterly winds and winds associated with cold fronts.

Table 12: 90th Percentile Weather conditions at the Park Ridge RAWS

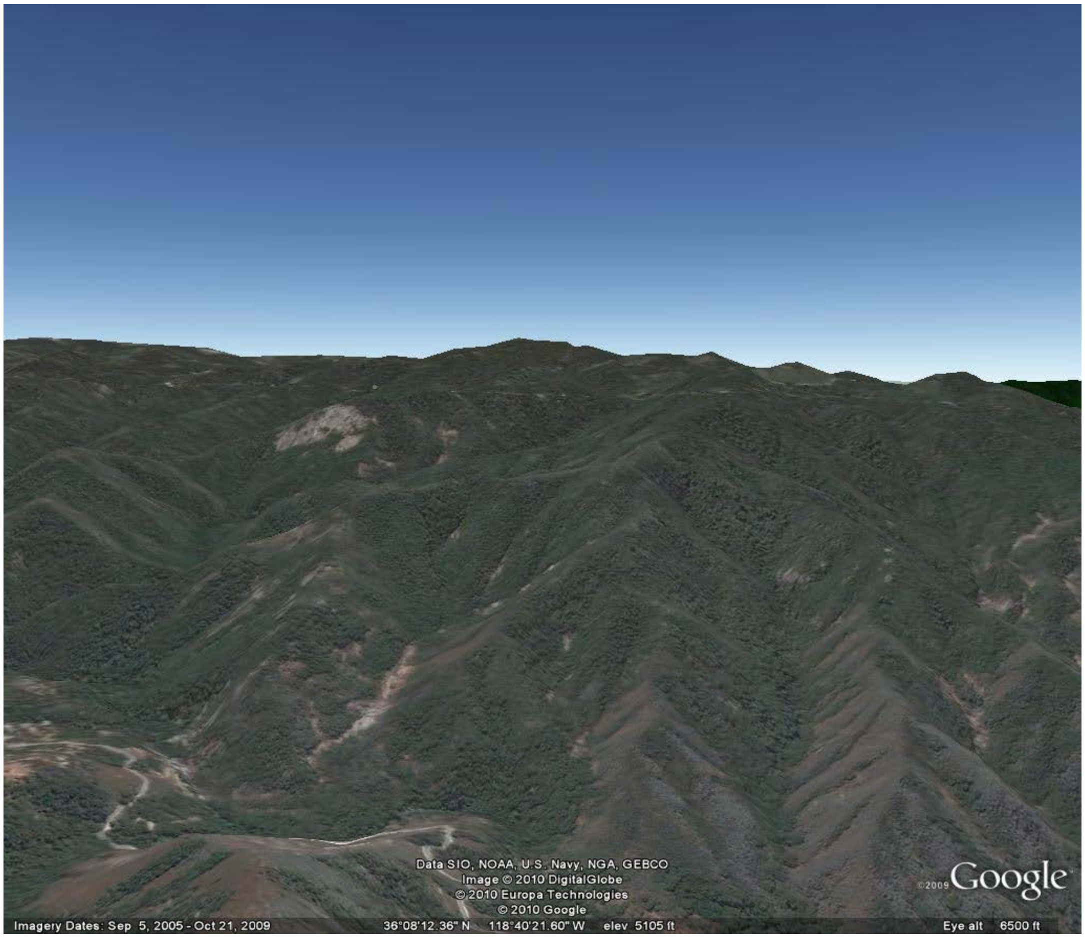
90th Percentile Weather		
1 hour Fuel Moisture	4 percent	0 to .25 inches in diameter
10 hour Fuel Moisture	4 percent	.26 to 1 inch in diameter
100 hour Fuel Moisture	6 percent	1 to 3 inches in diameter
1000 hour Fuel Moisture	7 percent	>3 inches in diameter
20 foot wind speed	7 mph	
Temperature	80°F	
Herbaceous Fuel Moisture	30 percent	
Woody Fuel Moisture	60 percent	

Under extreme, 90th percentile, weather conditions, the combination of topography, vegetation, and fuel loading in and around the grove is such that a wildfire could not be safely suppressed. Once a fire is established, a crown fire would likely initiate and spread. Such a fire would not only be a threat to Monument objects of interest, including giant sequoia trees, wildlife habitat, and cultural sites, but also to life, property, and other resources in the project area. For the TRRP Project these resources are the Tule River Indian Reservation, adjacent private property, water quality, large giant sequoia trees, and dispersed recreation sites. Stand-replacing fire could threaten life and property in the Tule River Indian Reservation and the community of Rogers Camp. The Tule River Tribal Council has identified the reservation as a community at risk through the California Fire Alliance.

Topography

The project area and adjacent lands north to the Tule River canyon consist of steep rugged terrain (Figure 6) with many ephemeral and intermittent streams flowing into perennial drainages that feed the Middle Forks of the Tule River. Aspects vary depending on drainage, but the general orientation is northerly. Elevations range from 4,800 to 7,300 feet. The majority of the slopes exceed 30 percent, with numerous ridges and drainages with a north/south alignment towards the Reservation boundary.

Figure 6: View looking south from Highway 190 to TRRP project area on upper 1/3 of slope to the ridgeline.



Fire Regime Condition Class (FRCC)

Fire regimes are a generalized description of the role fire plays in an ecosystem and characterized by fire frequency, predictability, seasonality, intensity, duration, scale, as well as variability. Condition classes are a function of the degree of departure from historic fire regimes resulting in alterations of key ecosystem components such as species composition, structural stage, and stocking levels. One or more disturbances can cause a departure in fire regimes such as fire exclusion, timber harvesting, insects and disease, and past management activities (Schmidt et al. 2002). There are three condition classes associated with fire regimes:

Condition Class 1: Fire regimes are within historical range of variability and the risk of losing key ecosystem components is low. Vegetation attributes (species composition and structure) are intact and functioning within a historical range.

Condition Class 2: Fire regimes have been moderately altered from their historical range. The risk of losing key ecosystem components is moderate. Fire frequencies have departed from historical frequencies by one or more return intervals (either increased or decreased), resulting in moderate changes to one or more of the following: fire size, intensity, severity, and landscape burn patterns. Vegetation attributes have been moderately altered from their historic range.

Condition Class 3: Fire regimes have been significantly altered from their historical range. The risk of losing key ecosystem components is high. Fire frequencies have departed from historic frequencies by multiple return intervals resulting in dramatic changes to one or more of the following: fire size, intensity, severity, and landscape burn patterns.

Condition Class 2 and 3 may require higher levels of restoration, by hand or mechanical treatments, to restore the process of fire on a landscape to historical fire regimes (Schmidt et al. 2002). Approximately 92 percent of the project area is in either condition class 2 or 3. Table 13 lists the estimated FRCC for the entire project area for the existing conditions. One goal of the Monument Plan is to slowly change the condition class trajectory back towards condition class 1. Often this is only accomplished by multiple treatment periods and this project may be viewed as one incremental step toward reaching that goal. FRCC is often viewed on a landscape, watershed, or fireshed spatial level; therefore the project area is a subset of a larger fire regime area on the landscape. More information on FRCC is available online at http://www.frames.gov/partner-sites/frcc/about/.

Table 13: Fire Regime Condition Class (FRCC) within TRRP Project

Fire Regime Condition Class	Percent of the project area	Percent of Grove
Class I	8	3
Class II	41	48
Class III	51	49

Vegetation

According to the *Tule River Reservation Protection Project Fire, Silviculturist Specialist Report* (Silviculturist Report) (Powell 2014), the proposed action and alternatives follow the legislative authorities for administration of the National Forest System fuels management programs; which are listed in Forest Service Manual 5150, (USDA 1991), and the Monument Plan (See Chapter 1 of this EIS).

I used modeling with the Forest Vegetation Simulator (FVS) to model the effects of no action, the proposed action, and alternative 3. I based the modeling on the California wildlife habitat relationship (CWHR) cover types (Mayer and Laudenslayer 1988). I modeled the planted stands separately. I modeled everything with and without a wildfire. Stand exam data and Forest Vegetation Simulator modeling (Dixon 2010) are on file at the Western Divide Ranger District. The results of this modeling are on file at the Western Divide Ranger District.

Existing Conditions

The TRRP project area includes 1,700 acres of the Black Mountain Grove, and 1,140 acres outside the grove. Existing conditions are based on stand exam data, the Black Mountain Giant Sequoia Grove Inventory (Grove Inventory) (Jump 2004), and FVS modeling. Overall the project area is composed of overstocked stands with virtually no regeneration of shade intolerant species outside some areas of planted trees (Jump 2004, Meyer and Stafford 2011).

The Black Mountain Giant Sequoia Grove spans portions of the Tule River Indian Reservation and the Monument. The majority of the grove, approximately 2,615 acres, is within the Monument and part of the Sequoia National Forest. The remaining 205 acres are in the Tule River Indian Reservation and on private property inholdings in the Monument.

According to the Grove Inventory Black Mountain Grove has a complicated land ownership history. From an early date, large areas of the grove were privately owned, or were included in the Tule River Indian Reservation. Some of this land was heavily logged for giant sequoias and other timber, while much of it remained pristine until 1960. Most of the grove in the Monument escaped significant pre-1950 logging. Meyer (1952) reported that almost all of the then Sequoia National Forest grove land still had little or no logging. Some areas in this part of the grove were partially cut in the 1950s. The 1964 to 1965 Solo Peak Timber Sale selectively harvested an unknown volume of non-sequoia conifers, by individual tree selection methods, on 116 acres. The early 1970s Black Mountain Sale focused on the western side of the grove.

Some of the grove was cut over before the Sequoia National Forest acquired it from private landowners in the 1975 Crawford Exchange. That area included land adjacent to Rogers Camp, as well as 120 acres near the Simmons Post Camp site.

As shown in Figure 1, there are an estimated 400 acres of planted trees in the project area. Outside the grove, approximately 142 acres were planted in the 1970s. These areas were planted with a mix of species, including sequoias both inside and outside the grove.

In the grove, approximately 12 unstocked acres were planted in 1964. In 1965, another 40 acres were planted. The Solo Sale and the Gauntlet Sale were implemented in the 1980s, mostly in the western part of the grove, to improve sequoia regeneration. These projects created 11 plantations covering approximately 206 acres in the grove. Non-sequoia "whitewoods" were harvested with the objective of obtaining giant sequoia regeneration, which was not happening naturally because of the dense, crowded stands and closed canopy (Figure 7). All large giant sequoia trees were protected during these harvests.

Figure 7: White fir infested with dwarf mistletoe in Black Mountain Grove.

Currently sequoias make up almost 18 percent of the trees in the planted stands in Black Mountain Grove, and almost 9 percent of the trees in planted stands in the TRRP project area outside the grove.

Tree Density

Outside of the planted stands, the species composition and structure in the TRRP project area is generally consistent both inside and outside the sequoia grove. As discussed in the Grove Inventory, there is a relatively broad representation of tree age classes, with most trees between 10 and 34 inches dbh, and between 70 and 150 years old. Most of the larger giant sequoia were 43 to 161 inches dbh, and too large to bore to determine age. Five sequoias between 23 and 41 inches dbh and averaging 152 feet tall, were bored and found to average 131 years old. In 2004 most of the overstory trees in the grove were between 100 and 200 years old, and the conifer and black oak canopy cover averaged 75 percent closed. The dense canopy cover favors shade-tolerant species such as white fir, and there is a lack of sequoia, ponderosa and sugar pine seedlings in these areas (Jump 2004). As shown in Table 14, giant sequoia trees average only 4 percent of the trees per acre, which is significantly below the desired number of sequoias (10 percent of trees per acre) needed to sustain the stand.

Table 14: Trees and Seedlings per Acre by Species in Black Mountain Grove outside Planted Stands[a]

Tree Species	Percent of Trees/ Acre	Number of Seedlings/ Acre	Percent of Basal Area / Acre
Giant sequoia	4	0	20
Ponderosa pine	4	10	1
Sugar pine	12	20	17
White fir	52	151	47
Incense cedar	17	55	10
Black oak	Not shown	31	Not shown
Nutmeg	Not shown	6	Not shown
Pacific dogwood	Not shown	55	Not shown
TOTAL	**89**	**328**	**95**

[a] From Jump 2004: Table 1. Species Composition, and Table 3. Seedlings per acre.

Most of the largest sequoias are located in groups in the planted stands, where the treatments in the 1980s created openings with bare mineral soil for these trees to provide seed for a new generation of sequoias. The 11 planted stands are the only areas in the grove with sequoia regeneration occurring at this time. Many of the planted and naturally occurring sequoia seedlings in these areas are over 20 feet tall (Figure 8).

Though the variety of species expected in a mixed conifer forest is present in the grove, the basal area reflects the years of fire suppression (Table 14). According to Jump (2004) sequoia represent 20 percent of average basal area per acre, which is about half the recommended amount in the inventory, and shows the unnaturally high amounts of shade-tolerant conifer species resulting from decades of fire suppression. In contrast, white fir is almost triple the basal area recommended for mixed conifer stands where fire has not been suppressed for so long. There is a lack of large sugar pines, in part because several have died in the past two decades. This dieback is due to lack of available soil moisture resulting from competition with the numerous white fir and other more shade-tolerant species. Another indicator of fire suppression, and that the grove is relatively young, is that 96 percent of the trees are mixed conifer with a large component of white fir (shade tolerant species), and the basal area is 80 percent mixed conifer as well, which is considered high in terms of natural variability. In a more mature grove that has had more frequent fires, these numbers would closer to 90 percent of trees in mixed conifer, and 35 percent of the basal area. Larger sequoias, though few in number, would represent the majority of the basal area due to their large size and volume.

Figure 8: Planted Stand created in the 1980s in Black Mountain Grove

As shown in Table 15 in 2004, the average basal area in the inventoried portion of the grove was 392 square feet per acre, of which 71 square feet per acre was in scattered sequoias that were generally larger than 40 inches dbh. As shown in Table 14, no sequoias seedlings were found during inventories. White fir 15 inches dbh or larger in size, account for 165 square feet of the basal area per acre. This level of stand density is much too high for maintenance of reasonable tree growth and vigor.

Table 15: Trees and Basal Area per Acre by Diameter Class in Black Mountain Grove [b]

Diameter Class (inches at dbh)	Basal Area per Acre (square feet)	Trees per Acre
1-4	6	133
5-10	39	90
11-14	31	31
15-20	52	38
21-28	64	30
29-38	58	20
39+	142	14
TOTAL	**392**	**356**

[b] From Jump 2004: Table 2. Grove Density and Tree Stocking by Diameter Class (conifers)

Evidence of density-related mortality is documented in the Grove Inventory datasheets. Fourteen of the 51 inventory plots had five or more snags and average 35 snags per acre in the grove. Most of the snags are white fir and sugar pine understory trees less than 20 inches dbh, which contribute to ladder fuels. As shown in Table 16, the majority of the snags are also in the suppressed category, which increases the likelihood of contributing to fuel ladders in the event of a fire.

Table 16: Snags per Acre by Crown Position in Black Mountain Grove Inventory [c]

Crown Position	Conifer	Hardwood	Total Snags by Crown Position
Dominant	3.3	0.16	3.46
Codominant	2.51	0.16	2.67
Intermediate	5.02	0.86	5.88
Suppressed	17.18	5.75	22.93
Total Snags by Type	28.01	6.93	34.94

[c] From Jump 2004: Table 7. Snags per Acre by Crown Position

Seventeen of the 51 inventory plots had six or more down logs on the 1/8 acres plot. Down logs, mostly 24 inches and larger in diameter, average 39 per acre and account for 44 tons per acre of the total fuel loading according to inventory data. A portion of the standing snags inventoried in 2004 are likely to have fallen, and have added to the surface fuel loading.

Overall, the inventory of the Black Mountain Grove shows that the grove is generally in a declining condition. The high tree density has been causing mortality in white fir and sugar pine over the past 40 to 50 years, as indicated by the large number of snags and down logs in the grove (Jump 2004). Based on Tables 14, 15 and, 16 giant sequoia regeneration is lacking overall, and shade-tolerant species (especially white fir) have increased. Trees less than 12 inches dbh are dominating much of the grove and, due to being suppressed and dying, make up the ladder fuels that lower the canopy base height in wildfire situations.

The forest stand conditions are the same in the areas proposed for treatment outside the grove, based on the stand exam data used in the FVS model. The term “Potential Natural Vegetation” refers to an expected state of mature vegetation in the absence of human intervention. This is analogous to the “Climax Plant Community” plant succession model (Henderson et al. 2011). The PNV on the best growing sites would be giant sequoia dominated mixed conifer, on good sites fir dominated mixed conifer and on poor growing sites montane hardwood conifer mix or mixed montane chaparral (North et al. 2009). Based on the stand exams and inventories, portions of the project area are at the climax plant community successional stage, which is not a stable state, especially considering the predicted changes in climate.

Fire suppression has altered the fire return interval in the project area. The accumulation of woody debris has led to an unnaturally high level of surface fuels in the majority of the grove and surrounding forest, which impedes establishment and growth of species such as pine and sequoia. Natural reproduction of shade-tolerant species such as white fir and incense cedar has also created fuel ladders that could take fire up to the overstory (Figure 7). Under extreme weather conditions a wildfire could result in a stand-replacing event, especially in the planted stands.

Watershed

According to the *Tule River Reservation Protection Project Hydrology Report* (Hydrology Report) (Courter 2014) there are two 6th field HUC watersheds affected by the TRRP project. Table 17 displays each 6th field HUC watershed by name and code, its corresponding 7th field sub-watersheds, stream class, beneficial uses, and approximate acres. The subwatersheds are also shown in Figure 9.

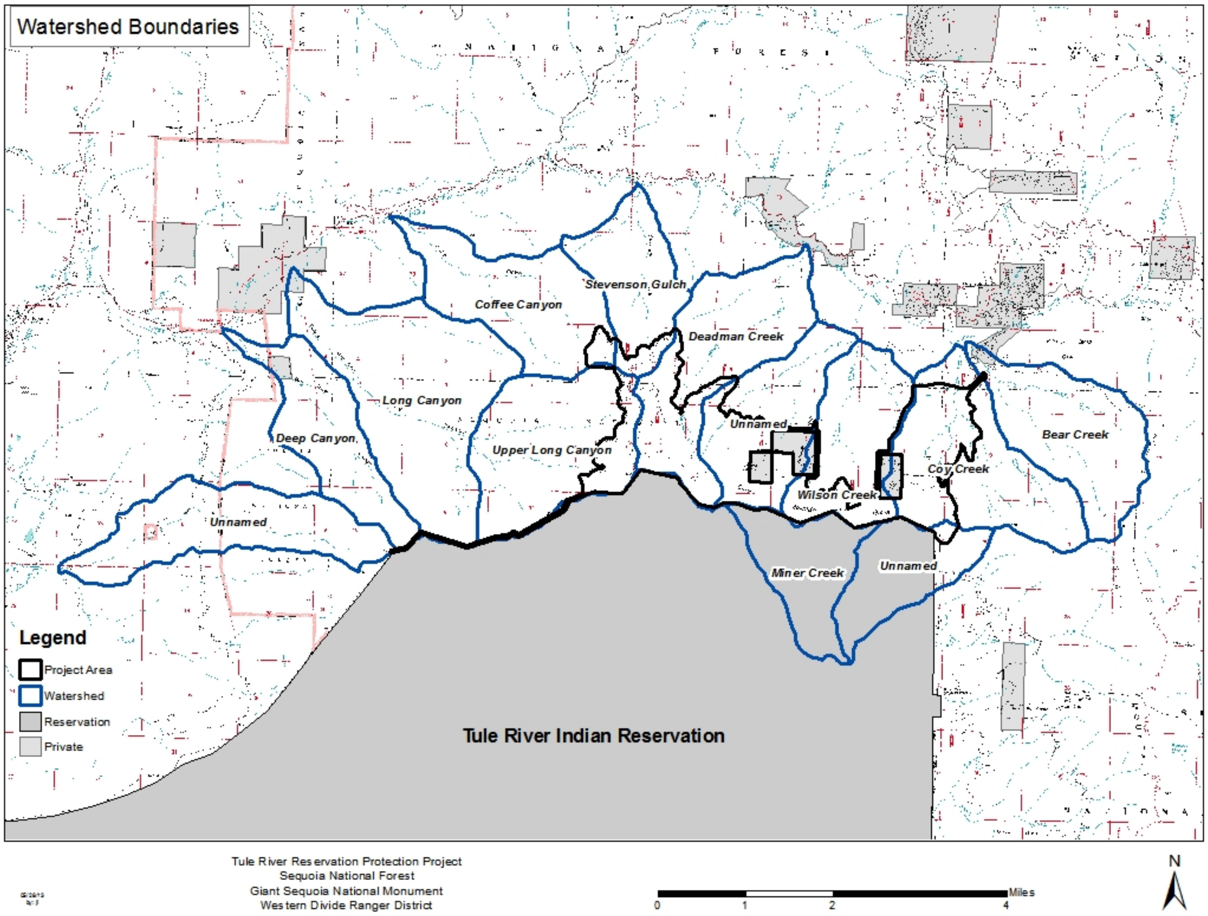
Table 17: Affected Watersheds in the Upper Tule River Basin

River Basin	6th Field HUC Watershed (name/#)	7th Field HUC Name/ Number	Stream Class	Beneficial Uses (Existing)	Miles of Stream[1]	Acres
Upper Tule 180300060	Middle Fork Tule River 1803000601	Deep Canyon (4CA)	IV	Agriculture, Freshwater	3.5	1234
		Long Canyon (4CB)	III	Agriculture, Recreation, Wildlife, Freshwater	6.9	2608
		Coffee Canyon (4CC)	IV	Fresh Water	4.3	1521
		Headwaters of Long Canyon (4CD)	III	Recreation, Wildlife, Freshwater	4.8	1760
		Stevenson Gulch (4DA)	III	Recreation, Wildlife, Freshwater	3.2	1042
		Deadman Creek (4DB)	III	Recreation, Wildlife, Freshwater	6.2	1843
		Unnamed (4DC)	III	Recreation, Wildlife, Freshwater	3.6	1261
		Wilson Creek (4DD)	II	Recreation, Coldwater fisheries, Wildlife, Spawning, Freshwater	3.3	1162
		Coy Creek (4DE)	III	Municipal, Recreation, Coldwater fisheries, Wildlife, Freshwater	8.0	1914
		Bear Creek (4DF)	III	Recreation, Coldwater fisheries, Wildlife, Freshwater	4.9	1478
	South Fork Tule River 1803000603	Unnamed (4EI)	III	Recreation, Wildlife, Freshwater	2.7	903
		Miners Creek (4EJ)	III	Recreation, Wildlife, Freshwater	2.0	954
		Graham SW (4FA)	IV	Agriculture, Freshwater	3.9	736

Known stream channel conditions within in each subwatershed are discussed by individual stream within each 7th field HUC within the project area. This discussion includes miles of streams, roads, and any recreational uses. All information was taken from the Sequoia National Forest's Geospatial Information System database. Figure 9 shows where the project area lies within each subwatershed.

[1] Values are approximate

Figure 9: TRRP Project Watershed Boundaries



Middle Fork Tule River Watershed

Deep Canyon (4CA)

Aerial photography and topography maps indicate the headwaters begin as a very high gradient, bedrock controlled, A1a+ channel type (see glossary for definition). Due to continuing bedrock controlled sections through most of the drainage, it is expected the channel is naturally stable. Leaving the Forest Service boundary, the privately held portion of Deep Canyon becomes a moderate to high gradient B or Ba+ channel type until its intersection with the Tule River (Middle Fork).

Deep Canyon subwatershed is a stream class IV and contains no campgrounds or recreation trails. Private property sits at the base of the subwatershed. The only road is a four-wheel-drive (4WD) road which follows the ridge top. Access to the 4WD road is from the Reservation. All of the estimated 3.5 miles of stream found in this subwatershed are considered intermittent. Other drainages found in this subwatershed are ephemeral channels.

Long Canyon and Headwaters of Long Canyon (4CB and 4CD)

Ocular observations and aerial review suggest that the tributaries in the headwaters of Long Canyon begin as a very high gradient Aa+ channel type. Where the tributaries meet to create the main creek, the channel is a series of steep pools and small waterfalls. It is a high to very high gradient, bedrock controlled, naturally stable, A and Aa+ stream channel type. As the stream enters private property, it transitions into a naturally stable, high gradient, cobble dominated, B3a+ channel.

Long Canyon and the headwaters of Long Canyon subwatershed, stream class III, contain Forest Roads (FRs) 21S25 and 21S25B. These roads are located at the top of the subwatershed. No current recreation trails exist. There is private property at the base of the subwatershed before the Tule River enters Long Canyon. The southern part of the subwatershed contains a 4WD road along the ridge and is only accessible from the Reservation. The headwaters are all intermittent or ephemeral channels. Out of approximately 11.7 miles of stream, 3.5 miles are perennial and 8.2 miles are intermittent. Other drainages are ephemeral channels.

Coffee Canyon (4CC)

Ocular observations and aerial review suggest that headwater tributaries begin as a very high gradient Aa+ channel type. Where the tributaries meet to create the main creek, the channel is a series of steep pools and small waterfalls. The channel is a bedrock-controlled, naturally stable, A and Aa+ stream type the rest of the way to its confluence with the Tule River.

Coffee Canyon subwatershed is a stream class IV. FR 21S12B ends in this watershed. There are no campgrounds, recreation trails, or private property. Coffee Canyon and an unnamed tributary are both intermittent channels. All 4.3 miles of stream are intermittent. Other drainages are ephemeral channels.

Stevenson Gulch (4DA)

The headwaters of Stevenson Gulch start below FR 21S12B and are intermittent in nature. The channel becomes perennial farther downstream. The stream is a bedrock-dominated A1/a+ channel with a high to very high gradient, and naturally stable through the rest of the subwatershed.

Stevenson Gulch, stream class III, contains two roads, FR 21S12 and 21S12B, located near the headwaters. No campgrounds, recreation trails, or private property currently exist in the watershed. There are approximately 3.2 miles of stream. Approximately 1.7 miles are perennial and 1.5 miles are intermittent. Other drainages are ephemeral channels.

Deadman Creek (4DB)

The headwaters of Deadman Creek begin as a moderate gradient, stable sensitive, gravel dominated, B4 channel type. In the flatter and lower portions of the creek, it changes to a moderate gradient, naturally stable, cobble-dominated B3 channel type. Boulders and some bedrock are scattered throughout the lower portions of the subwatershed.

The headwaters of Deadman Creek begin at Solo Peak and are considered a stream class III subwatershed. The headwaters area contains Forest Roads 21S25, 21S25A, 21S25C, 21S25D, 21S12, and 21S12A. No campgrounds or recreation trails exist. Private property is located at the base of the watershed near the South Fork Middle Fork Tule River. Approximately 6.2 miles of stream drain the watershed: 5.5 miles are perennial and 0.7 miles are intermittent. Other drainages are ephemeral channels.

Unnamed Creek (4DC)

The headwaters of this Unnamed Creek include both an intermittent channel, located on private property, and a perennial channel. The perennial channel begins as a moderate gradient, stable sensitive, sand-dominated B5 channel type. Below Forest Road 21S12, the stream transitions to a gravel-dominated B4 channel type.

The Unnamed Creek subwatershed, stream class III, joins with the lower portion of the Wilson Creek subwatershed. The headwaters area contains Forest Roads 21S12 and 21S58. There is private property in the headwaters area, along and adjacent to the west side of Bateman Ridge. No recreation trails or campgrounds currently exist. Out of approximately 3.6 miles of stream, 2.7 miles are perennial and 0.9 miles are intermittent. Other drainages are ephemeral channels.

Wilson Creek (4DD)

Wilson Creek alternates between a high gradient, naturally unstable, gravel dominated, A4 channel type in its headwaters and a moderate to high or moderate gradient, naturally stable, cobble dominated, B3 or B3a channel type in the middle of the subwatershed. The lower reach of Wilson Creek, near the confluence with the South Fork Middle Fork (SFMF) Tule River, is bedrock-controlled, but remains cobble-dominated.

Wilson Creek is a stream class II subwatershed. The headwaters begin below FR 21S12. The road is located at the top of the subwatershed. Private property sits along Bateman Ridge. Approximately 3.3 miles of stream drain this watershed, with 1.6 miles of perennial and 1.7 miles of intermittent streams. Other drainages are ephemeral channels.

Coy Creek (4DE)

The headwater tributaries to Coy Creek begin as naturally unstable, high to very high gradient, cobble-dominated A3 or A3a+ channels. The perennial sections of Coy Creek are moderate to high gradient, naturally stable, cobble-dominated B3 channel types with some bedrock control scattered throughout the creek.

Coy Creek subwatershed, stream class III, begins outside and to the east of the project boundary. Coy Flat Campground is near the base of the subwatershed, as well as FR 21S88. The main road through the subwatershed is FR 21S94. Rogers Camp is private property and sits along the west side and near the top of the subwatershed. Approximately eight miles of stream flow through this watershed, with one mile of perennial and seven miles of intermittent streams. Other drainages are ephemeral channels.

Bear Creek (4DF)

Bear Creek changes from a naturally stable, very high to high gradient, bedrock and boulder dominated A1/a+ and A2 channel type at the top of the subwatershed to a naturally stable, moderate gradient, cobble dominated B3 channel type at the bottom of the subwatershed.

Bear Creek subwatershed, stream class III, contains two perennial streams: Bear Creek and an unnamed stream. Residential structures sit in the bottom of the subwatershed, just before the confluence of the SFMF Tule River. Bear Creek Trail starts inside private property and connects to the Summit Trail at the top of the subwatershed. The terrain is very steep, with the creeks beginning at the top of Slate Mountain. Approximately 4.9 miles of stream flow in this watershed, with 3.1 miles of perennial and 1.8 miles of intermittent streams. Other drainages are ephemeral channels.

South Fork Tule River Watershed

Unnamed Creek (4EI)

Unnamed Creek subwatershed is a stream class III. The majority of the subwatershed is on the Reservation. All 2.7 miles of stream are perennial. Only 0.2 miles of the perennial flow is located on NFS land. The small portion of the subwatershed on national forest contains no roads, campgrounds, recreation trails, or private property.

Miners Creek (4EJ)

Minimal portions of the watershed are outside the national forest boundary. The majority of the subwatershed on NFS lands contains no defined intermittent or perennial channels. Miners Creek, stream class III, flows through the northwestern portion of the Reservation. Little of the watershed lies beyond the national forest boundary. The majority of the subwatershed on NFS land contains no defined intermittent or perennial channels. Approximately 2.0 miles of stream are perennial. Other drainages are ephemeral channels. There are no streams flowing from NFS lands.

Graham SW (4FA)

Aerial photography and topography maps suggest the headwaters of Graham SW begin as a very high gradient, naturally stable, Aa+ channel type. Farther downstream the channel transitions to a moderate to high gradient, naturally stable B or Ba+ channel type.

Graham SW subwatershed contains one perennial stream and is a stream class IV. The upper half of the subwatershed consists of NFS lands, and the lower portion crosses a small inclusion of private property. Approximately 3.9 miles of stream are intermittent and other drainages are ephemeral channels. Approximately 1.9 miles of stream are on NFS land.

Seventh Field Subwatersheds Potentially Affected by the TRRP Project

Not every subwatershed within the two HUC 6 watersheds is part of the TRRP project. There are 13 subwatersheds total that could be affected by the project. Table 18 displays each subwatershed's sensitivity[2], miles of stream, and size in acres.

The project area encompasses only a portion of the total acres in each subwatershed. Alternative 3 proposes the most acres of treatment, approximately 2,815. Table 18 shows the maximum acres potentially affected by the project.

Table 18: Subwatersheds Potentially Affected by the TRRP Project

Subwatershed Number	Subwatershed Name	Subwatershed Sensitivity[3]	Subwatershed Acres	Project Acres	Percent Affected
4CA	Deep Canyon	High	1234	8	0.6
4CB	Long Canyon	High	2608	15	0.6
4CC	Coffee Canyon	High	1521	86	5.7
4CD	Headwaters of Long Canyon	High	1760	346	19.7
4DA	Stevenson Gulch	High	1042	115	11.0
4DB	Deadman Creek	High	1843	694	37.7
4DC	Unnamed	High	1261	491	38.9

[3] Determined by the Sequoia National Forest's Cumulative Watershed Effects model using data from soil, topography, climate, geology, vegetation, and channel stability.

Subwatershed Number	Subwatershed Name	Subwatershed Sensitivity[3]	Subwatershed Acres	Project Acres	Percent Affected
4DD	Wilson Creek	High	1162	259	22.3
4DE	Coy Creek	High	1914	713	37.3
4DF	Bear Creek	High	1478	1	0.1>
4EI	Unnamed	Moderate	903	43	4.8
4EJ	Miners Creek	Moderate	954	43	4.5
4FA	Graham SW	High	736	1	0.1

Stream Condition Inventories

Two of the subwatersheds, Bear Creek and Wilson Creek, contain long term monitoring sites. These long term monitoring sites follow regional Stream Condition Inventory (SCI) protocol. These sites were established before project implementation. Once the project has been completed, a follow up survey will be completed to document any possible changes to the chemical, biological, and physical characteristics of the site.

Wilson Creek (4DD)

Wilson Creek contains one Steam Condition Inventory (SCI) site near the confluence of the South Fork Middle Fork Tule River. The site was established in 2006 to monitor the Tule River Reservation Protection Project. Table 19 summarizes the SCI data collected. The stream channel is a high gradient, cobble dominated, naturally stable, low impact, B3a channel type. The reach length is 50 meters.

Table 19: Summary of Wilson Creek SCI Data

Resource	Measurement
Large Wood Debris (m^3/m)	0.68
Percent Shading	59 – 93
Temperature (Celsius)	14
pH (ppm)	6.5
Alkalinity ($CaCO_3$)	80
Mean Particle Size in mm (D50)	146.91
Width to Depth Ratio	13.62 – 18.23
Hilsenhoff Biotic Index - Rating	2.28
Riparian Impact Rating	Low
Rosgen Channel Type	B

Figure 10 displays the particle size distribution throughout the reach. The average size particle, intersection of the 50 percent finer and data results, is derived from this figure in order to classify the reach channel type.

Figure 10: Particle Size Distribution for Wilson Creek in 2006

Average stream shading along the reach provides approximately 82 percent cover. Water chemistry measured include: total alkalinity, pH, and stream temperature. Total alkalinity results are 80 ppm $CaCO_3$ while the pH was slightly acidic at 6.5. Recorded stream temperature for that day was 14 degrees Celsius. Average amounts of large woody debris were 0.68 m^3/m.

Aquatic species collected in 2006 indicate water quality is excellent with no apparent organic pollution. The Hilsenhoff Biotic Index and Rating (Zimmerman 1993) of 2.28 indicated excellent water quality with no apparent organic pollution.

Results from the SCI survey conclude the stream is within natural variability, has no apparent organic pollution, good water quality, and has an average canopy cover shading of 82 percent. The site is in a great location to monitor for changes in the watershed due to the stream being a stable sensitive system.

Bear Creek (4DF)

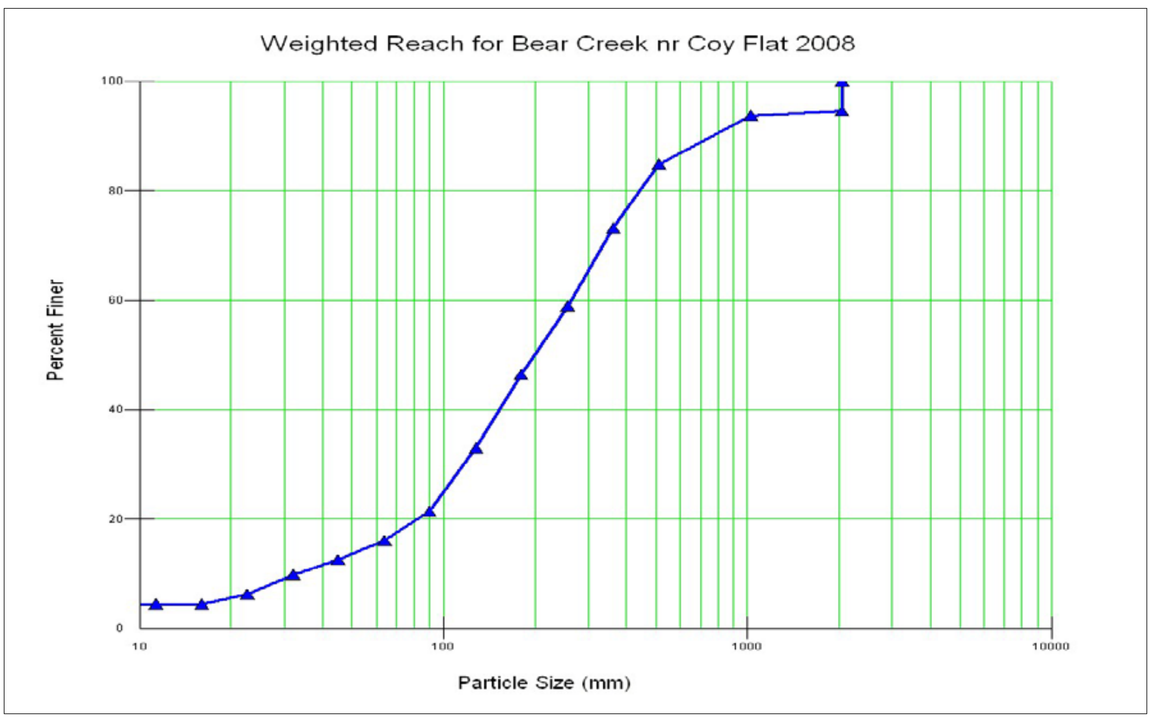
In 2008 a SCI site was established on Bear Creek near Coy Flat. The site is located near the base of the subwatershed and was established to monitor the Tule River Reservation Protection Project. Table 20 summarizes the SCI data. The stream channel is a high gradient, cobble dominated, naturally stable, low impact, B3a channel type. The reach length is 183 feet. .

Table 20: Summary of Bear Creek SCI Data

Resource Name	Measurement
Large Wood Debris (m^3/m)	0.12
Percent Shading	83 – 96
Temperature (Celsius)	12
pH (ppm)	7
Alkalinity ($CaCO_3$)	180
Mean Particle Size in mm (D50)	201.71
Width to Depth Ratio	11.8
Hilsenhoff Biotic Index - Rating	4.06
Riparian Impact Rating	Low
Rosgen Channel Type	B

Figure 11 displays the particle size distribution throughout the reach. The average size particle is cobble.

Figure 11: Particle Size Distribution in Bear Creek in 2008



Average stream shading provides approximately 91 percent cover throughout the reach. Average amount of large woody debris was 0.12 meter^3/meter. Water chemistry measured total alkalinity, pH, and stream temperature. Recorded total alkalinity was 180 ppm $CaCO_3$. The pH was neutral at 7.0. Recorded temperature for that day was 12 degrees Celsius.

Aquatic species collected in 2008 indicate water quality is very good with possible slight traces of organic pollution. The Hilsenhoff Biotic Index and Rating (Zimmerman 1993) of 4.06 indicated very good water quality, with possible slight organic pollution.

Results from the SCI survey conclude the stream is within natural variability, good water quality, and has an average canopy cover shading of 91 percent. The site is in a great location to monitor for changes in the watershed due to the stream being a stable sensitive system.

Cumulative Watershed Effects for Affected Environment (Current Conditions)

Past and present activities within the analysis area include grazing, wildfire, prescribed burning, timber harvest, road construction and reconstruction, road maintenance, trail construction and maintenance, recreational use, mining, and residential development. The Sequoia National Forest's Cumulative Watershed Effects model is used as part of this analysis to account for these activities in each subwatershed associated with the project. Table 21 displays each subwatershed, total equivalent roaded acres (ERAs) available, ERAs used by past projects, and how much remains before the threshold of concern (TOC) is at maximum.

Table 21: Current Cumulative Watershed Effects

Subwatershed Number	Subwatershed Name	ERAs Available	ERAs Used to Date	ERAs Remaining	Percent TOC Used
4CA	Deep Canyon	37.02	1.75	35.27	4.74
4CB	Long Canyon	78.24	0.51	77.73	0.65
4CC	Coffee Canyon	45.63	0.14	45.49	0.31
4CD	Headwaters of Long Canyon	52.80	6.65	46.15	12.59
4DA	Stevenson Gulch	31.26	2.76	28.50	8.84
4DB	Deadman Creek	55.29	6.11	49.18	11.06
4DC	Unnamed	37.83	3.92	33.91	10.37
4DD	Wilson Creek	34.86	0.31	34.55	0.90
4DE	Coy Creek	57.42	25.69	31.73	44.74
4DF	Bear Creek	44.34	11.83	32.51	26.68
4EI	Unnamed	36.12	12.34	23.78	34.17
4EJ	Miners Creek	38.16	0.00	38.16	0.00
4FA	Graham SW	22.08	2.65	19.43	12.02

Subwatersheds potentially affected by the Tule River Reservation Protection (TRRP) project are either class III or IV streams, with the exception of one subwatershed, Wilson Creek (4DD), as a class II. Most of these streams are a combination of intermittent and ephemeral channels. The terrain overall is steep creating moderate to high gradient stream channels. Both SCI surveys are within their range of natural variability and are located in a stable sensitive riparian ecotype, which allows for detection of changes in key features to the overall stability and health of the streams. Cumulative Watershed Effects analysis for existing conditions concludes no subwatersheds are over threshold of concern (TOC). TOC ranges from approximately 0 percent used to 44 percent used.

Wildlife

Biological Assessment/Biological Evaluation

The TRRP Project encompasses a variety of vegetative communities as identified under the California Wildlife Habitat Relationships (CWHR) classification system (CDFG 2005). Sierran mixed conifer (SMC) is the dominant vegetation type present encompassing an estimated 83 percent of the analysis area. The SMC vegetation type is represented by a mix of tree species, including black oak, incense cedar and ponderosa pine at lower elevations, and incense cedar, sugar pine, white fir, and giant sequoia at mid to high elevations. Understory vegetation includes black oak, Pacific dogwood, Canyon live oak, beaked hazelnut, bush chinquapin, whitethorn, currant, snow berry, grasses and forbs (Jump 2004). Small inclusions of montane hardwood-conifer (nine percent), montane hardwood (eight percent), and brush types (less than one percent) occur at lower elevations and on side slopes. Table 22 displays the complete listing of CWHR habitat types and acres.

Table 22: CWHR Vegetation Types and Acres in the TRRP Project Area

CWHR Vegetation Type	Acres	Percent of project area
Sierran Mixed Conifer (SMC)	2,344	83
Montane Hardwood-Conifer (MHC)	244	9
Montane Hardwood (MHW)	236	8
Barren, Montane and Mixed Chaparral	14	<1
Total Acreage	2,838*	100

*All habitat and treatment acres in the project area were generated using GIS mapping software. These values are approximate and may vary slightly between treatment areas and CWHR totals based on specific habitat characteristics.

Existing habitat types and acres for each species were determined using the CWHR system (CWHR 2005), and Geographic Information System Layer (GIS) published by the USDA Forest Service (Pacific Southwest Region Remote Sensing Lab). The GIS layer was refined and corrected where needed based on stand exam data, aerial photos, and field review.

Table 23 displays the CWHR vegetation types by size and density classifications and acres. Aspects of stand structure important to many of the wildlife species addressed in the Wildlife BE/BA include the use of stands with: higher overhead canopy, an availability of large live trees and snags, and large woody debris. Vegetation types with the most value in providing these requirements include Sierran mixed conifer, montane hardwood-conifer, and montane hardwood with size and density classes 6, 5D, 5M, 4D, and 4M (Table 23).

Table 23: CWHR Vegetation Type, Size Class and Density Found in the TRRP Project Area.

Habitat type	Acres	Percent of Analysis Area	CWHR Size [a] and Density [b]	Acres
Young Sierran mixed conifer (SMC), montane hardwood-conifer (MHC), and montane hardwood (MHW).	89	3.0 percent	Barren and Mixed Shrub	14
			1 & 2 S, P, M, X	75
Sierran mixed conifer, montane hardwood conifer, and montane hardwood	441	16	3S	102
			3P	51
			3M	81
			3D	207
Sierran mixed conifer, montane hardwood conifer, and montane hardwood	2308	81.0	4S	13
			4P	63
			4M	241
			4D	599
			5S	30
			5P	65
			5M	275
			5D	266
			6	756
Total	2838	100		2838

a - Tree Size: **1 =** < 1 " dbh, **2 =** 1" - 6" dbh, **3 =** 6" - 11" dbh, **4 =** 11" - 24" dbh, **5 =** > 24" dbh, and **6 =** class 5 trees over a distinct layer of class 4 or 3 trees
b - Density in terms of Canopy Closure: **S =** 10-24 percent, **P =** 25-39 percent, **M =** 40-59 percent, **D =** 60-100 percent, and **X =** canopy unknown

Dead trees (or snags) are an essential component of forest ecosystems for wildlife because they provide a variety of decadence features (cavities, loose bark, broken tops) that are suitable for rest, nest or den purposes. Snag development is caused through a variety of mortality agents (fire, disease, and drought) which target different tree species and age classes; thus resulting in a mix of snag sizes and types across the landscape. Bull et al. (1997) noted that snag distribution can be clumpy due to the often-localized effect associated with tree mortality. Data available from old-growth stand inventories conducted in the Sierra Nevada and giant sequoia groves within Sequoia National Forest provide a range of variability for snag and down log resources within mature stands (Table 24).

Table 24: Snag and Down Log Occurrences in Old-growth Mixed Conifer Forests and Giant Sequoia Groves in Sequoia National Forest.

Publication/Reference	Mean Number of Snags	Mean Number of Down Logs
Beardsley et al. 1999 Old Growth Forest in the Sierra Nevada (Mixed Conifer)	12/acre (>10" dbh.[4]) 4/acre (>20" dbh)	14/acre (>6" dbh) 6/acre (>20" dbh)
USDA 2013, Giant Sequoia Groves and Inventory (Appendix I)	7/acre (>10" dbh) (range 3-12 snags/acre)	28/acre (>10" dbh)

The figures displayed in Table 24 suggests an average snag range of variability of three to 12 snags per acre, with snags greater than 20 inches dbh ranging between two to four snags per acre. These values were compared with stand exam data collected in forest types found throughout the TRRP Project landscape[5]. There is an estimated 6.3 snags per acre (greater than 15 inches dbh), with snags 24 inches dbh and greater estimated at 3.2 snags per acre. These values lie within the expected range of variability for the forest types present. Because snags are formed through a variety of mortality agents, it is recognized that some acres may deviate, either lower or higher, from these estimates.

Table 25 shows the estimated number of down logs by size class based on collected data within the TRRP Project area. There is an estimated 39 down logs per acre (or 49.1 tons per acre). When comparing these values to that noted in Table 23, values lie toward the high side of the range noted within mature stands.

Table 25: Down Logs per Acre by Diameter Class within the TRRP Project Area.

Diameter Class (Inches)	Number of Logs	Tons/Acre
10 - 15.9	15	2.05
16 - 23.9	8	2.98
24+	16	44.07
Total	39	49.1

Wildlife Species Analyzed in Detail

Management of wildlife species and their habitat, and maintenance of a diversity of animal communities, is an important part of the mission of the Forest Service (Resource Planning Act of 1974, and National Forest Management Act of 1976 (NFMA)). Management activities on NFS lands are planned and implemented so that they do not jeopardize the continued existence of threatened or endangered species, or lead to a trend toward listing or loss of viability of Forest Service Sensitive species (Forest Service Manual (FSM) 2672) (USDA 2005b). Desired conditions for wildlife in the Monument Plan are that lands continue to provide a diverse range of habitats that support viable populations of associated vertebrate species, with special emphasis on riparian areas, montane meadows, and late successional forests (USDA 2012a)

[4] Diameter breast height (dbh.)

[5] Estimated values for the TRRP Project include snags ≥ 15" dbh

Three documents were completed for the assessment of wildlife resources. These include: 1). The *Biological Assessment for the Tule River Reservation Protection Project* (Wildlife BA) (Galloway 2014a) which documents the review of the potential effects of TRRP Project on species classified as federally endangered or threatened under the Endangered Species Act (ESA, 1973) (19 U.S.C 1536 (c)); 2). the *Biological Evaluation for the Tule River Reservation Protection Project* (Wildlife BE) (Galloway 2014b) documents the review of potential effects of implementing the TRRP Project on Pacific Southwest Region sensitive species; and 3) the Management Indicator Species Report (MIS Report) (Cordes 2014) evaluates the impacts on selected species habitat that are found within the TRRP project.

Table 26 displays the wildlife species evaluated in detail for the TRRP Project, and provides reference to the specific wildlife document which addressed it in detail. Information provided in this section of this EIS was summarized from the Wildlife BA, BE, and the Management Indicator Species (MIS) Report. Certain TES and MIS were eliminated from the need for detailed review based on various criteria related to scope and intensity of the project, season of use, habitat requirements, geographic range, or prior consultations with resource specialists. See Table 26 for the status of each species and where its effects analysis can be found (See the BE (Appendix A) , the BA (Appendix A), and Table 1 in the MIS report for further documentation and rationale).

The MIS Report addressed animal species identified in the Sierra Nevada Forests MIS Amendment Record of Decision (ROD) signed December 14, 2007 (USDA 2007). Guidance regarding MIS is for Forest Service resource managers to (1) at the project scale, analyze the effects of proposed projects on the habitat of each MIS affected by such projects, and (2) at the bioregional scale, monitor populations and/or habitat trends of MIS. Project-level effects on MIS habitat involves examining the impacts of the proposed project alternatives on MIS habitat by discussing how direct, indirect, and cumulative effects will change the habitat in the analysis area, and as they relate to the broader Bioregional scale.

Table 26: Wildlife Species Considered in Detailed Analysis for the TRRP Project.

Species	Status	Effects Analysis Document
California condor (*Gymnogyps californianus*)	FE, CH	Biological Assessment
Northern Goshawk (*Accipiter gentilis*)	FSS, CSSC	Biological Evaluation
California spotted owl (*Strix occidentalis occidentalis*)	FSS, CSSC, MIS	Biological Evaluation
Fisher (*Martes pennanti*)	FSS, FC, CSSC	Biological Evaluation
American marten (*Martes americana*)	FSS, CSSC, MIS	Biological Evaluation
Pallid bat (*Antrozous pallidus*)	FSS, CSSC	Biological Evaluation
Fringed myotis bat (*Myotis thysanodes*)	FSS	Biological Evaluation
Fox sparrow (*Passerella iliaca*)	MIS	MIS Report

Species	Status	Effects Analysis Document
Mule deer (*Odocoileus hemionus*)	MIS	MIS Report
Mountain quail (*Oreotyx pictus*)	MIS	MIS Report
Sooty grouse (*Dendragapus obscurus*)	MIS	MIS Report
Northern flying squirrel (*Glaucomys sabrinus*)	MIS	MIS Report
Hairy woodpecker (*Picoides villosus*)	MIS	MIS Report
Status Key: FE-Federally Endangered, FC – Federal Candidate Species, CH-Designated Critical Habitat, FSS-Forest Service Sensitive, CSSC-California State Species of Concern, MIS-Forest Service Management Indicator Species		

Common risks to habitat identified for mature forest associated species in the Southern Sierra Nevada

Climate Change: The Intergovernmental Panel on Climate Change (IPCC, 2001) projects a doubling of atmospheric carbon dioxide (CO2) from industrial sources by as early as 2050. Climate responses to increased CO2 are expected to vary regionally and topographically, but a universal trend toward warming is expected due to trapping of heat by greenhouse gases. California is thought to be highly vulnerable to the effects of climate change due to coastal and latitudinal orientation, extreme elevation gradients, and the variety of ecosystems present (Snyder, et al., 2002). Because California's ecosystems are already stressed by human growth and agricultural demands, added stress from climate change could substantially alter the current biotic landscape. Climate modeling indicates that the overall effects of global warming on California will include higher average temperatures in all seasons, higher total annual precipitation, and decreased spring and summer runoff due to decreases in snowpack (USEPA 1989, USEPA 1997 IN: USDI 2003).

Although the potential impacts of climate change have not been evaluated quantitatively in the southern Sierra Nevada, it is anticipated to alter habitats and their structural composition (North et al. 2012). In general there is an expectation that there will be an upward shift in latitude and elevation as warming occurs and species move to areas that meet their metabolic temperature needs. For some species like the fisher, this may provide a broader range of habitat availability as decreased snow levels would open up access to habitat at higher elevations, given the animal's tendency to avoid deep snow. For others like the marten, a further upward shift in distribution may lead to decreases in habitat availability because of the lack of forest environments at the highest elevations.

Climatic variation may also produce habitat alterations that have the potential for both beneficial and negative influences on wildlife species. For example, the California spotted owl appears to exhibit population-specific demographic relationships with local weather and regional climates, as well as the need for dense canopy (North et al. 2000, Seamans 2005). Therefore, climate change may have greater impact on a broad range of species and individuals when working in tandem with habitat reductions through losses in overhead canopy. These combined effects have the potential to reduce the buffering influence provided by dense canopied stands that work to maintain cooler micro-site conditions at nest and den sites, against warming conditions. In contrast, increased rainfall during the growing season may result in improving vegetative productivity leading to more food for species and their prey. Lastly, the predicted hot dry summers could lead to a greater increase in the frequency and severity of wildfires. Fire regimes respond rapidly to changes in climate and are likely to continue to drive short term responses in terms of vegetation floristics and structure (Flannigan et al. 2000, Dale et al. 2001). Greater incidence of wildfires have the potential to reduce the frequency and distribution of important structural features used by most forest interior species such as large trees, high canopy cover, snags and woody debris (Safford, 2006).

Uncharacteristically Severe Wildfire: The cessation of burning noted by early Native Americans, and the implementation of fire suppression policies over much of the 20st century have negatively affected many forests in the southern Sierra Nevada. This has resulted in widespread accumulation of forest fuels that have moved forests beyond the natural fire regimes of relatively small, low-intensity fires to larger, more complex high-intensity fires. Data on fire frequency, size, total area burned, and severity show increases in the Sierra Nevada over the last two decades. Studies such as Westerling et al. (2006) and Miller et al. (2009) note that the Sierra Nevada can expect further increases in fire activity and that data indicate that the mean and maximum fire sizes, and total burned area in the Sierra Nevada, have strongly increased between 1980 and 2007. Subsequently, forests are experiencing changes in plant species composition, reduced productivity and structural heterogeneity, as well as increased susceptibility to insect infestations (Lofroth, et al., 2010).

These stand-replacing fires affect large areas of the landscape, decreasing or removing key structural elements and habitat including large trees and snags, overstory and understory canopy, vegetative diversity, and near ground cover (dead and down trees and brush). Substantial decreases in structural complexity and forest composition on a landscape basis may affect how rare terrestrial species, such as the fisher and marten, may move at the micro-site, watershed, and landscape scales. As part of the threat evaluation completed for the West Coast Fisher Conservation Assessment (Lofroth, et al., 2010), uncharacteristically severe wildfire ranked as a high threat in the southern Sierra Nevada geographic area. These threats would be similar for other species using similar habitat conditions.

Threatened, Endangered, or Proposed Species

California Condor *(Gymnogyps californianus)*

Based on the review completed in the Biological Assessment only one federally listed species, the California condor (*Gymnogyps californianus*), has the potential to be affected as a result of the TRRP Project. The California condor was listed by the U.S. Fish and Wildlife Service as a Federal Endangered species in 1967, with critical habitats designated nine years later within Tulare, Kern, Los Angeles, Ventura, Santa Barbara, and San Luis Obispo Counties.

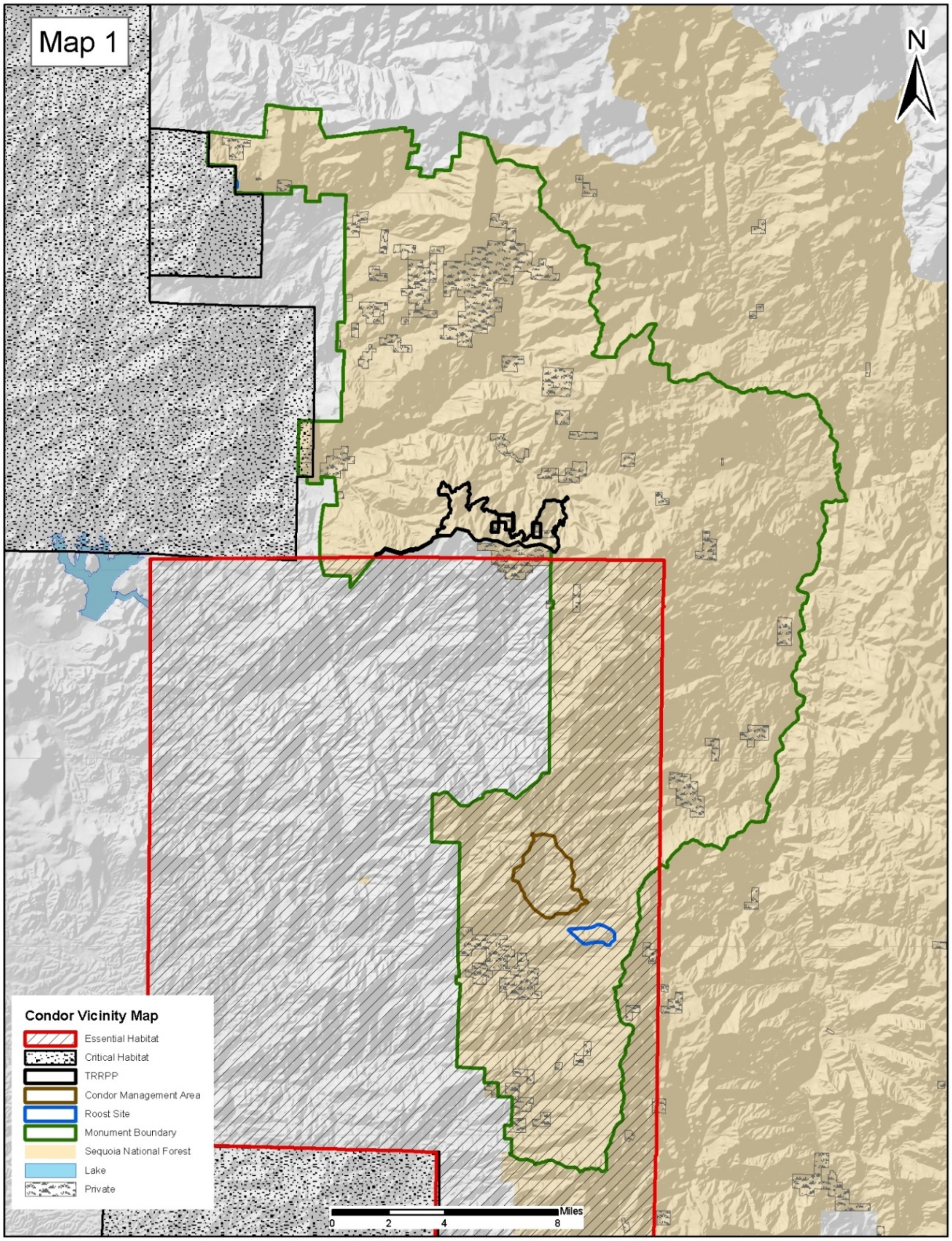
The current distribution of condors in California are limited to a “U” shaped zone extending from the coastal mountains at Santa Clara and San Mateo Counties south to Ventura County, east to the western slope of the Tehachapi Mountains, and north through the west slope of the Sierra Nevada Mountains to Fresno County (Figure 12) (USDI 1984b and 1996). Existing critical habitat in close proximity to the Monument is displayed in Figure 13 along with other historic condor use sites.

Figure 12: Current range distribution for the California condor in California.

Condors are being reintroduced into the mountains of southern California north of Los Angeles Basin, in the Big Sur vicinity of central California Coast, and near the Grand Canyon in Arizona. As a result, some slight range expansions are being noted. As of June 30, 2013, the total California condor population included 431 individuals of varying ages. This included 200 condors in the captive population and 231 in the wild (including 71 in Arizona, 130 in California, and 30 in Baja California) (USDI 2013b).

The Monument Plan strategy for the California condor and its habitat is to follow the most current U.S. Department of the Interior (USDI) Fish and Wildlife Service California Condor Recovery Plan (USDI 1996). The Recovery Plan instructs forests to continue to implement enforcement of guidelines that protect known suitable nesting and roosting sites on public lands. The 1988 Forest Plan (USDA 1988) identified the historic Starvation Grove Nest Site (approximately 2,960 acres) and the Lion Ridge Roost site (490 acres) as receiving special management (Figure 13). Neither of these areas occurs within the TRRP Project vicinity.

Figure 13: California Condor Designated Critical Habitat and High Use Vicinity Map



Nesting Habitat and Use - The present nesting range for the condor in the state is quite limited, with over 90 percent of the nest locations occurring within a 56-mile area encompassing portions of Los Padres and Angeles National Forests. Courtship, nest selection, and egg-laying typically occur from October through May. The egg is incubated by both parents and hatches approximately 59 days later. Chicks take their first flight six to seven months later and are fully independent the following year. Condors predominately nest on various types of rock escarpments such as cliffs, caves, overhanging ledges, crevices, and potholes, which are relatively isolated and surrounded by brush (Snyder and Schmitt, 2002, USDI 1984). There are also a few instances recorded where condors have nested in large redwoods, where a cavity of sufficient size was used. Dimensions measured at one nest cavity located in a giant sequoia tree were 5 feet high, 3 feet wide, and 2.5 feet deep. Other conifer tree species have not been used in this fashion and apparently cannot reach a diameter large enough to support a cavity of sufficient size for the condor.

A pair of condors was found nesting in Starvation Grove in a large redwood in 1984 prior to the recapture program where all condors were brought into captivity. Since the re-introduction program began to release condors back into the wild in 1992, no further nesting attempts have occurred on Sequoia National Forest. It is conceivable that as young adults re-occupy their historic range with more consistency, nesting activity could occur on the Forest. At present, no territorial establishment indicative of a nesting attempt has been observed. These findings are based on annual discussions with members of the Condor Recovery Team and condor flight data provided through daily satellite monitoring. It is estimated that condors are currently accessing the forest approximately two to 12 times annually for periods of a day to a week. Most are limited to short visit forays through the Breckenridge Mountains and further north to the foothill and upslope mountain regions around the communities of Glennville and Woody, California, a popular foraging area.

Roosting Habitat and Use - A series of roost areas has been identified where heavier historic use by condors once occurred. These include the Blue Ridge Condor Area (Critical Habitat #6, USDI 1996), located approximately eight air miles north of the TRRP Project. The remaining historic roost sites identified in the Forest Plan (USDA 1988) are located a minimum of 14 air miles south of the TRRP Project on the west slope of the Greenhorn Mountains (Lion Ridge and Basket Peak) and further to the south in the Breckenridge Mountains. Over the last four years, a total of 14 instances of overnight roosting activity occurred in the Monument. There were two years where no overnight roosting occurred (2010 and 2013), one year with two instances of overnight roosting (2011), and one year with 12 instances of overnight roosting (2012). Of the 14 total occurrences, 11 of these sites occurred on the west slope of the Greenhorn Mountains south of the Tule River Indian Reservation, with three occurring north of the Reservation. Of the latter grouping, two sites occurred near Mountain Home State Forest and one site occurred in the upper basin of Long Canyon, west and north of the TRRP Project.

Roost locations are often located upslope of popular foraging areas, with condors most commonly selecting a large dead tree or emergent large live conifer for these purposes. Koford (1953) noted that roost trees are often situated above cliffs or on the upper two-thirds of steep slopes where there is a long unobstructed space for downhill flight. These conditions are exhibited by the Long Canyon roost location which lies above a foraging area (Critical Habitat #9, see below discussion on foraging habitat). Roost sites do not occur on the very tops of ridges where there is little protection from the wind, but most often down below the ridgeline.

Foraging Habitats and Diet - The principal foraging habitat regions near the Sierra Nevada include west slope grassland and oak-savannah habitats at lower elevations within the foothill region directly adjacent to the southern San Joaquin Valley. Designated critical habitat for the condor encompasses primarily privately held range lands in Kern and Tulare Counties. This includes the foothill rangelands around the small community of Glennville/Woody, California (Critical Habitat #8), and in central Tulare County, Critical Habitat #9 which extends from Frazier Valley north across Yokohl Valley to approximately Lemon Cove and east to the national forest boundary (Figure 13).

California condors are opportunistic scavengers, feeding mainly on carcasses of large dead animals such as livestock (cows, sheep, horses) and mule deer. Typical foraging behavior includes long-distance reconnaissance flights, lengthy circling flights over a carcass, and hours of waiting at a roost or on the ground near a carcass. Some seasonal diet shifts have been noted based on food availability. For example, condors tended to move to the Tehachapi area during the hunting season where they showed a preference for deer gut-piles or un-retrieved deer carcasses over calf carcasses (USDI 1996). Condors were also noted to frequent the San Emigdio area of the San Joaquin Valley during the calving season.

Risk Factors - Factors influencing condor decline, or which have resulted in disturbance, are fairly well understood. Contributing factors have included incidental shootings, egg collecting, collisions with power lines or other obstacles, and various forms of poisoning (USDI 1996, AOU 2008). Some of these factors have been greatly reduced through behavior modification training and new state legislation banning use of lead ammunition. Condor selection and use of habitats can be modified by increased disturbance levels. However, with current satellite monitoring technology, nesting territories or consistent roost areas can be identified and protected if needed from noise or other forms of human disturbance.

Sensitive Species

Species and Habitat Accounts

Northern Goshawk (*Accipiter gentilis*)

State Wide Range, Distribution, and Trend: The northern goshawk is a year-round resident throughout many higher elevation areas of California. It appears well distributed across its core breeding range in most of the northern Coast Ranges, the Klamath and Siskiyou Mountains, across the Cascades, Modoc Plateau, Warner Mountains, and south through the Sierra Nevada (Shuford and Gardali 2008, USDA 2001). The SNFPA FEIS reported 577 breeding territories within Sierra Nevada national forests in 2001 (USDA 2001), although actual population trends in California are not well understood (Keane 2008).

A network of northern goshawk protected activity centers (PACs) has been established on Sequoia National Forest based on known and newly discovered breeding territories. PACs are managed to protect nest sites and their adjacent habitats. At present, there are 26 goshawk PACs identified in the network, each encompassing approximately 200 acres, for an estimated 5,200 acres in total. There are 14 designated northern goshawk PACs within the Monument.

None of the designated goshawk PACS fall within the TRRP Project area. However, three PACs occur in relative close proximity to it (less than 0.25 mile) (Figure 14). Table 27 provides information on all three PACs, and best known occupancy status.

Table 27: Goshawk Protected Activity Center Occupancy in the Vicinity of the TRRP Project

PAC Name	PAC (acres)	Last Documented Occupancy Status	PAC overlap with the TRRP project area (percent)
Long Canyon	200	Adult, 1990	0
West Wilson	200	Pair, nest with young 2013	0
Roger's Camp	200	Pair, nest with young, 2009	0

Habitat Preference and Biology: The northern goshawk is associated with the use of older-age conifer, mixed, and deciduous forests. Forest stands with high suitability contain an availability of large live trees for nesting, a closed canopy for protection and thermal cover (generally exceeding 50 percent canopy cover), and open space in the understory for maneuverability and flight (Hargis et al. 1994, Squires and Kennedy 2006). Northern goshawks forage in diverse forest types and conditions. Large snags and downed logs are considered important components within foraging habitat because such features benefit various prey species (Reynolds et al. 1991).

Using the CWHR Model, there is an estimated 208,590 acres of high and moderate capability nesting habitat for the goshawk in the Monument, with an estimated 2,137 acres found within the TRRP Project area.

Reproduction and Home Range: Nesting chronology varies annually and by elevation. In general, nesting is initiated in February with nest construction, egg-laying, and incubation occurring through May and June (Dewey et al. 2003). Young birds hatch and begin fledging in late June and early July and are independent by mid-September. Goshawk nests are generally constructed in live trees and are usually among the largest trees in the stand. Nest trees averaged 32 inches dbh in the Lake Tahoe region, 34 inches dbh in the Inyo National Forest, and 51 inches dbh in Yosemite National Park (USDA 2001). Nest sites located in PACs near the TRRP Project have similarly occurred in large live trees (four nest sites, 102, 69, 55, and 137 inches in diameter). Human disturbance has the potential to cause northern goshawks to abandon nest sites during the nesting and post fledging period (Boal and Mannan 1994, USDA 2001). Responses to disturbance can be quite variable and dependent on the individuals occupying the site.

Canopy cover values at nest sites appear to vary widely throughout California (USDA 2001). Based on documented mean values, the range extends from 31 percent (sd =13) reported on the Inyo National Forest (n=20), to 70.4 percent (se =3.1) reported in the Lake Tahoe region (N=35). Based on available scientific literature and personal knowledge with existing nest sites found on Sequoia National Forest, suitable canopy cover for nesting habitat for this analysis was defined at 50 percent or greater.

The mean breeding home range size for females varies in the Sierra Nevada. Reynolds et al. (1991) discussed three components found within the goshawk's nesting home range. These include the nest stand, the post-fledgling family area or PFA, and the broader foraging area. The nest areas typically contain one or more stands of large old trees with a dense canopy cover, a sparse understory, and frequently occur on gentle benches or at the bottom of moderate hill slopes (nest stands range 30 to 200 acres)(Reynolds et al. 1991, Woodbridge and Dietrich 1994). The PFA surrounds the nest area and represents an area of concentrated use by the family after the young leave the nest, until they are no longer dependent on the adults for food. PFAs were found to average about 420 acres (Kennedy et al. 1994). Habitat in the PFA is more variable, but contains pockets with similar composition to that of the nest stand. The broader foraging area beyond the PFA encompasses the remainder of the home range and is comprised by forests of varying composition and structure.

For the purposes of evaluating effects of the TRRP Project alternatives, CWHR habitat scores were calculated for each goshawk PAC (Figure 14 and Table 28). In addition, while not part of the current Forest network for goshawks, a PFA was established for this analysis and also scored using CWHR. Each PFA encompassed approximately 420 acres and included portions of the goshawk PAC (Squires and Kennedy 2006, Reynolds et al. 1991, Kennedy et al. 1994). The PFA buffer was centered on the last known nest tree or adult location and was established by using a 0.452 mile radius buffer. Weighted habitat scores using CWHR scoring system were used to evaluate both existing and post project conditions by alternative (Table 28).

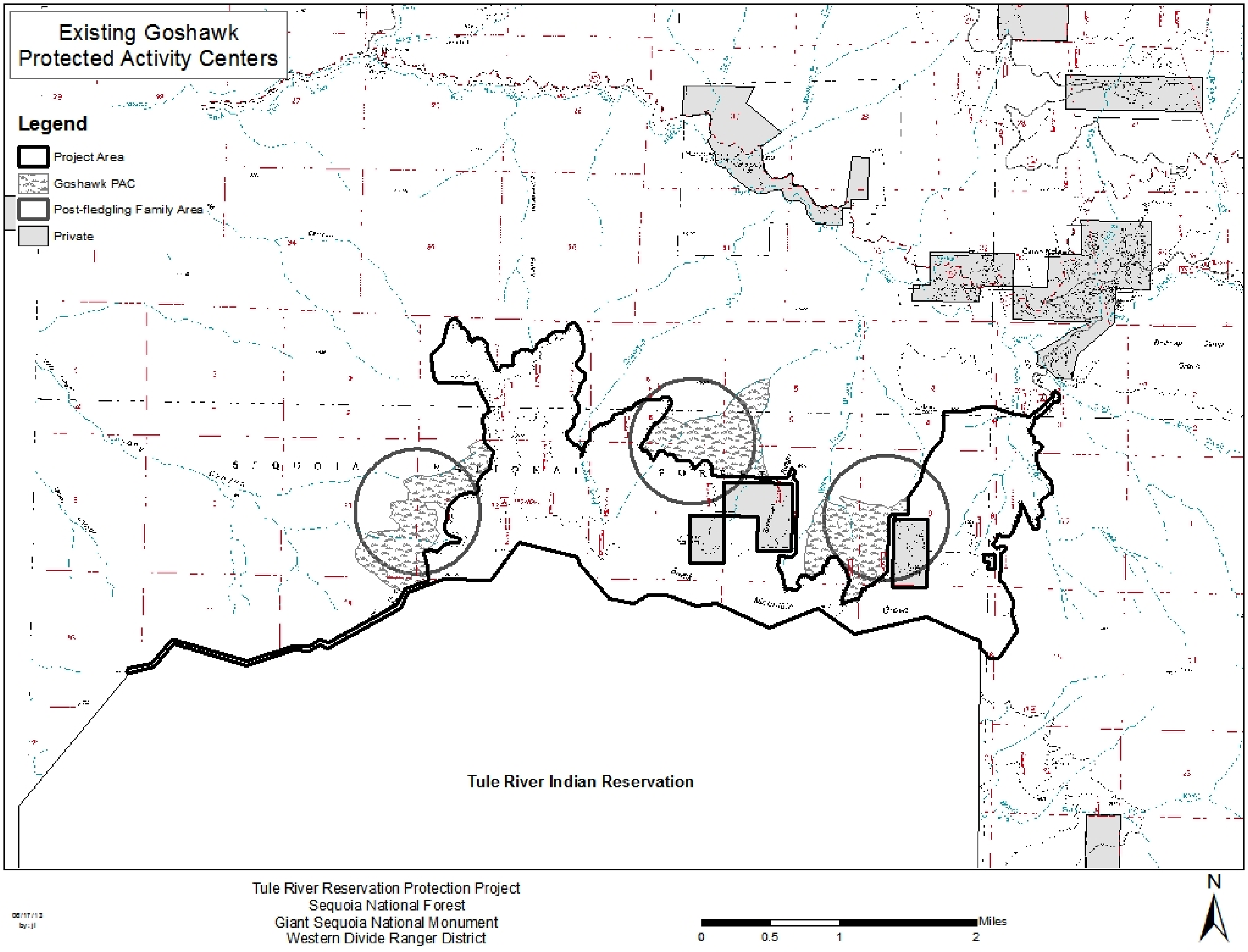
Table 28: Goshawk PAC and PFA Overlap (percent) with the TRRP Project Area, CWHR Habitat Suitability Score, Total Habitat Acres, and Total Suitable Habitat Acres

Goshawk Site ID Number	PAC/PFA* overlap with project area (percent)	Existing CWHR Habitat Suitability Score	Total PAC or PFA Acres	Nesting/Roosting Habitat Acres (CWHR 4M, 4D, 5D, & 6)
Long Canyon	PAC (0)	1.00	249	249
	PFA (18)	0.984	420	409
West Wilson	PAC (0)	0.927	229	200
	PFA (36)	0.814	420	285
Rogers Camp	PAC (0)	0.961	212	208
	PFA (21)	0.956	420	329

*- PFA may include PAC acres and is based on a 0.452 radius circle from the most recent nest tree. The PFA equates to approximately 420 acres to estimate an area of heightened importance for the goshawk.

Prey Resources: Northern goshawks have evolved morphological adaptations for capturing prey in forested environments, but are also capable of ambushing prey in open habitats. Reynolds and Meslow (1984, IN: USDA 2001) found that goshawk take prey from both the ground-shrub and shrub-canopy layers. Some authors suggest that goshawks also forage along edge environments created between dense forests and adjoining habitats such as brush fields, plantations, meadows, streams, and some instances along roads. The key species or species groups that are more prevalent in goshawk diets in the Sierra Nevada include Douglas squirrel, Spermophilus spp. (golden-mantled squirrel, Belding squirrel, and California ground squirrel), chipmunks (Tamias spp.), Stellar’s jay, northern flicker, and American robin (USDA 2001). Many of these species are ground dwellers or spend a proportion of their time near the ground. Important components for foraging habitats also include an availability of snags (minimum of three per acre greater than 18 inches dbh) and downed logs (minimum of five per acre greater than 12 inches dbh) for prey populations. Reynolds et al. (1991) hypothesized that relatively open shrub and lower canopy layers within forested stands may facilitate prey detection and capture by northern goshawks (USDA 2001).

Figure 14: Northern Goshawk PACs and PFAs in the Vicinity of the TRRP Project



<u>California spotted owl (Strix occidentalis occcidentalis)</u>

State Wide Range, Distribution, and Trend: The range of the California spotted owl includes the southern Cascades south of the Pit River in Shasta County, the entire Sierra Nevada Province of California (extending into Nevada), all mountainous regions of the Southern California Province, and the central Coast Ranges at least as far north as Monterey County (USDA 2001). California spotted owl populations in the Sierra Nevada remain relatively continuous and uniform in distribution, with an estimated 1,865 owl territories documented (USFWS, Federal Register May 24, 2006 [Volume 71, Number 100]). This includes 1,399 territories documented on NFS lands and an additional 448 owl territories on non-NFS lands (ibid).

The USFWS has also conducted several significant status reviews of the California spotted owl in response to listing petitions (published 12-month findings: *Federal Register* 2003, *Federal Register* 2006). The latest finding, dated May 23, 2006, evaluated several contentions with potential to influence the status and distribution of the California spotted owl. These included: 1) Revisions to the 2001 Sierra Nevada Forest Plan Amendment (SNFPA) published in the 2004 SNFPA Supplement Final Environmental Impact Statement (SFEIS, USDA 2004); 2) Revisions to the California State Forest Practices Code; 3) Possible changes to the draft meta-analysis of the population dynamics of the California spotted owl in the final, published meta-analysis (Franklin et. al. 2004); 4) Impacts of recent and anticipated future fires in spotted owl habitat; and 5) Further range expansion of the barred owl (USFWS, *Federal Register* May 24, 2006 [Volume 71, Number 100]).

The USFWS declined to list the species and concluded that “impacts from fires, fuels treatments, timber harvest, and other activities are not at a scale, magnitude, or intensity that warrants listing, and that the overall magnitude of threats to the California spotted owl does not rise to the level that requires the protections of the Act” at this time. In this determination, the USFWS evaluated both management actions contemplated in the 2004 SNFPA SFEIS and other expected disturbances and found that catastrophic wildfire was the highest threat to the owl and its habitat. The best-available data at that time indicated that California spotted owl populations were stationary, and there was not strong evidence for decreasing linear trends in the finite rate of population growth (lambda) in studies conducted in the Sierra Nevada (USFWS, *Federal Register* May 24, 2006 [Volume 71, Number 100]).

The population trend of this species in the Sierra Nevada continues to be monitored through general surveys, monitoring of nests and territorial birds, and demography studies (Verner et al. 1992; USDA Forest Service 2001, 2004, 2011, Blakesley et al. 2010, Munton et al. 2012; USFWS, Federal Register May 24, 2006 [Volume 71, Number 100], Sierra Nevada Research Center 2007). Current data at the range wide, California, and Sierra Nevada scales indicate that, although there may be localized declines in population trend in some areas [e.g., localized decreases in “lambda” (estimated annual rate of populations change], the distribution of California spotted owl populations in the Sierra Nevada is considered stable (Blakesley et al. 2010). A new meta-analysis capable of evaluating the current trend from comparable data from all the studies is anticipated to occur in 2014.

The availability of existing habitat to support spotted owl populations in the Sierra Nevada does not appear to be a limiting factor. The California Spotted Owl Technical Assessment (Verner et al. 1992) identified areas where there were gaps or bottlenecks in owl distribution or areas of low population density, habitat fragmentation or loss of habitat. Rather than “reflecting current negative effects on spotted owls, these identified areas of concern simply indicate where future problems may be greatest if the owl's status in the Sierra Nevada were to deteriorate." The TRRP Project Area does not encompass any gap or concern areas as identified by Verner et al. (1992).

Distribution within Sequoia National Forest and TRRP Project Area: Sequoia National Forest represents the southern end of the spotted owl's range in the Sierra Nevada. At present, the Forest manages a network of 140 spotted owl Home Range Core Areas (HRCAs) encompassing an estimated 84,000 acres. Each HRCA includes 600 acres (USDA 2001) comprised of a 300 acre PAC surrounding the documented nest/roost site, and an additional 300 acres of suitable habitat. Of the Forest network of HRCAs, 73 HRCAs are found within the Monument of which five occur within the vicinity of the TRRP Project. The spotted owl territories potentially influenced by the TRRP Project represent approximately four percent of the Forest total. Table 29 displays the most recent occupancy status for each PAC based on field surveys.

Table 29: California Spotted Owl PACs and Occupancy Status in the Vicinity of the TRRP Project

PAC ID	Within TRRP Project	Year of Survey						BEST STATUS YEAR
		2007	2008	2009	2011	2012	2013	
TUL0028	No	Pair /2yng	Surveyed, No Response	Pair	Not surveyed	Not Surveyed	Pair, non-repro inferred	Pair/2 yng, 2007
TUL0201	Yes	Pair, nest and repro inferred	Pair, non repro inferred	Surveyed, No response	Not surveyed	Not Surveyed	Pair	Pair/1 yng, 2001
TUL0173	Yes	Pair, nest and repro unknown	Pair/1 yng.	Pair /2 yng.	Pair	Pair	Pair/1yng	Pair/1 yng, 2013
TUL012	Yes	Male & Female detection, repro status unknown	Surveyed, No Response	Surveyed, No Response	Not surveyed	Pair	Pair, non repro inferred	Pair/2 yng, 1992
TUL013	Yes	Resident Single	Not Surveyed	Pair, repro unknown	Pair, 1 yng	Male	Pair/2 yng	Pair/2yng 2013

Habitat Preference and Biology: On a state-wide basis, the majority of documented spotted owl sites occur in mid elevation mixed conifer forests (80 percent), 10 percent occur within red fir forests, seven percent in ponderosa pine/hardwood forests, and three percent occur in other forest types such as: east-side pine, ponderosa and Jeffrey pine and foothill riparian/hardwood (Verner et.al 1992 IN: USDA 2001, USFWS, Federal Register: February 14, 2003 [Volume 68, Number 31]).

Six major studies (Gutierrez et al. 1992, Chapter 5) described habitat relations of the California spotted owl in four general areas spanning the length of the Sierra Nevada. These studies examined spotted owl habitat use at three spatial scales: landscape; home range; and nest, roost, or foraging stand. By comparing the amount of time California spotted owls spend in various habitat types to amounts of habitat available, researchers determined that spotted owls preferentially used areas with at least 70 percent canopy cover, used habitats with 40-69 percent canopy cover in proportion to its availability, and spent less time in areas with less than 40 percent canopy cover than might be expected.

In studies referenced by Gutierrez et al. (1992), California spotted owls foraged most commonly in intermediate-to late-successional forests with greater than 40 percent canopy cover and a mixture of tree sizes, some larger than 24 inches dbh. California spotted owls consistently used stands with significantly greater canopy cover, total live tree basal area, basal area of hardwoods and conifers, snag basal area, and dead and downed trees, when compared to random locations within the forest.

Based on review of available research, Verner (et al. 1992) offered tentative estimates for forest attributes capable of meeting nesting and foraging habitat parameters in Sierran mixed conifer forests as displayed in Table 30.

Table 30: Attribute Values of Suitable California Spotted Owl Habitat in Sierran Mixed Conifer Forest (Verner et al. 1992)

Stand Attributes	Nesting Habitat	Foraging Habitat
Percent Canopy Cover [a]	70-95 percent	50-90 percent
Total Live Tree Basal Area [b]	185-350 sq. ft./acre	180-220 sq. ft./acre
Total Snag Basal Area of large snags per acre [c]	20-30	7-17
Downed Woody Debris [d]	10-15 tons/acre	10-15 tons/acre

[a] Mostly in canopy > 30 ft. high, including hardwoods.
[b] Square feet per acre
[c] Dead trees >15" DBH and >20' tall.
[d] Tons per acre.

Continued research on California spotted owl populations from the four demographic studies located on the Lassen, Eldorado, and Sierra National Forests and Kings Canyon National Park have occurred since publication of the technical report (Verner et al 1992). This has increased the number of documented nest sites where vegetative conditions have been evaluated. CWHR classifications based on plot data from these studies were displayed in the SNFPA FEIS (USDA 2001) for 292 nest sites. Approximately 45 percent of the sites occurred in CWHR size and density classifications 6, 5D, and 4D (stands with greater than 60 percent canopy cover), with an estimated 30 percent in size and density classifications 5M and 4M (stands with 40 to 59 percent canopy cover), and approximately 15 percent in stands with less than 40 percent canopy cover. Based on available scientific literature and personal knowledge with existing nest sites found on Sequoia National Forest, suitable canopy cover for nesting habitat was defined as mature, multi-layered stands with canopy cover of 60 percent and greater. Foraging habitat may be more variable and generally include mature stands with a minimum canopy cover 40 percent or greater.

Using the CWHR Model for the California spotted owl there is an estimated 210,328 acres of moderate and high capability habitat in the Monument, with an estimated 2,137 acres of suitable habitat within the TRRP Project boundary.

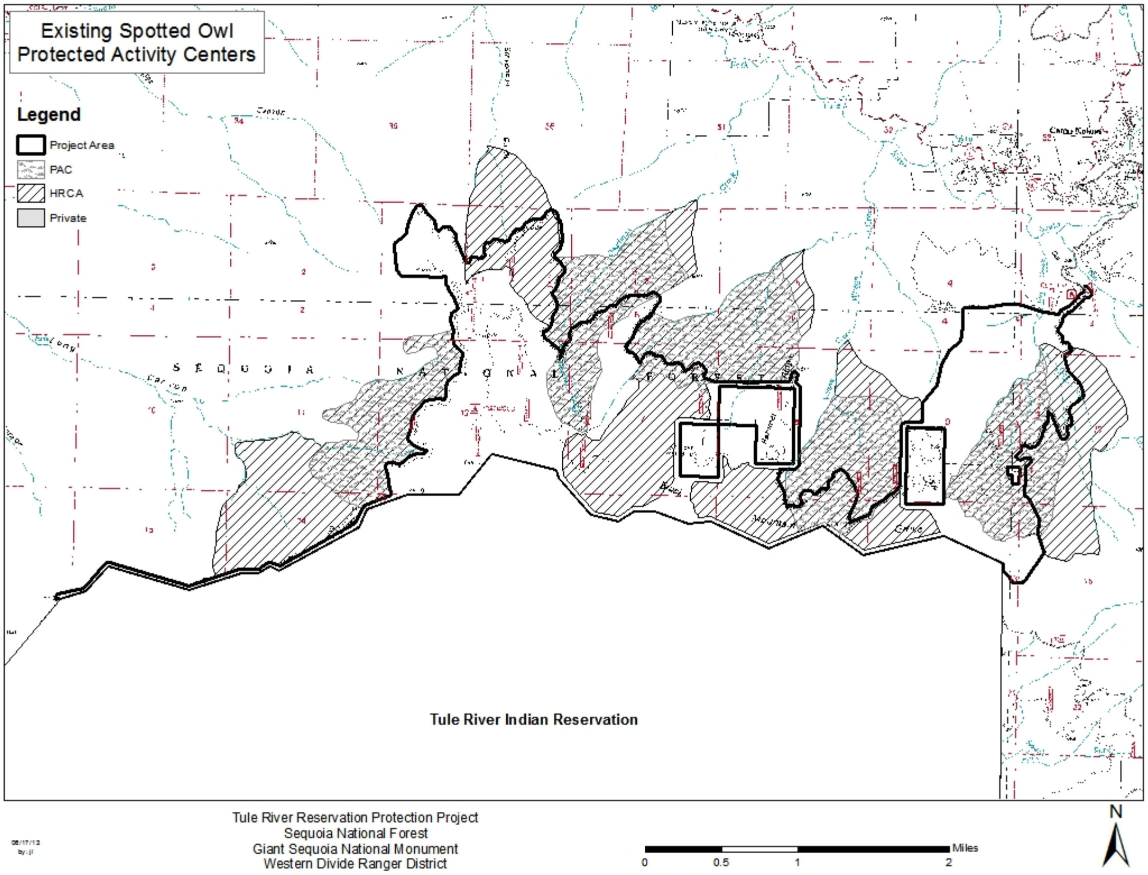
Reproduction and Home Range: The spotted owl breeding cycle extends from mid-February to mid-to late September. Egg-laying through incubation, when the female spotted owl must remain at the nest, extends from early April through mid to late May. Spotted owls nest in a variety of tree/snag species in pre-existing structures such as cavities, broken top trees, and platforms such as mistletoe brooms, debris platforms and old raptor or squirrel nests (Gutierrez et al. 1992, 1995). Young owls typically fledge from the nest in mid-to late June. In the weeks after fledging, the young are very weak fliers and remain near the nest tree. Adults continue to bring food to the fledglings until mid-to late September when young disperse. Summarized information regarding the dispersal abilities of California spotted owls is scant. Information in Verner et al. (1992) indicates that two-thirds of the juveniles would be expected to disperse at least eight miles.

Not all pairs of California spotted owls nest every year. It is not unusual for owls in an established activity center to skip several years between one nesting and the next. The spotted owl, as a species, has apparently evolved high adult survival rates associated with irregular and unpredictable reproduction (Noon and Biles 1990), where a long life span allows eventual recruitment of offspring even if recruitment does not occur each year (Franklin et al. 2000). Spotted owls are long lived and have been documented to live in excess of 17 years in the wild, and adult survival rates in the Sierra Nevada are relatively high (greater than 0.80; Noon et al. 1992, Blakesley and Noon 1999, Steger et al. 1999), indicating the species may be able to persist over the short-term even with extensive reduction in the amount of its suitable habitat (Noon et al. 1992).

California spotted owl home range sizes in the Sierra Nevada have proved variable. All available data indicate that home ranges are smallest in habitat at relatively low elevations that are dominated by hardwoods, intermediate in size in conifer forests in the central Sierra Nevada, and largest for true fir forests in northern Sierra Nevada (Verner et al. 1992). The combined PACs/HRCAs are intended to represent a subset of the home range area where the owl finds suitable nests/roosts and where they accomplish a substantial amount of their foraging. Based on an analysis of telemetry studies on the California spotted owls closest to Sequoia National Forest, the mean breeding pair home range size was estimated at approximately 2,500 acres (mixed conifer type)(USDA 2001). Bingham and Noon (1997, IN: USDA 2001) found the “overused” portion of a spotted owl’s breeding home range (core area) to be 20 to 21 percent of the home range. The designated HRCA of 600 acres established for pairs on Sequoia National Forest amounts to approximately 20 percent of the area described by adding one standard error to the mean breeding pair home range.

California spotted owl PACs/HRCAs within the TRRP Project occur in an evenly spaced distribution from west to east with all located in the mid slope region of the Upper Tule River watershed (Figure 16). All of the PACs contain a pair of spotted owls with at least one year of reproduction on record. Topography is moderately steep and compartmentalized by a series of ridgelines that drop to the Tule River. The north facing aspect of the Black Mountain giant sequoia grove allows for moister conditions and likely increases habitat suitability. In addition, many forest stands contain a good representation of black oak in the understory, providing a benefit for prey of the spotted owl.

Figure 15: California Spotted Owl PACs and associated HRCAs in the Vicinity of the TRRP Project



Fire history data shows that few fires have impacted the TRPP PACs/HRCAs (Figure 5 in the Fire and Fuels section) over the last century, with only two of the five PACs/HRCAs (TUL0201 and TUL0173) experiencing a wildfire over the last 85+ years. Accumulated dead and down biomass and ladder fuels can carry fire horizontally through the forest and vertically into the upper canopy putting structurally complex forests suitable for the spotted owl at risk for stand replacing fire. A review of research conducted by Roberts and North (Chap. 5 IN: North 2012) suggests that high fuel loading and ladder fuels may work to decrease habitat suitability for the spotted owl in core areas (Blakesley et al. 2005). The increasing proportion of smaller trees (less than 23 inches dbh) around the nest, even with dense canopy of greater than 70 percent, can negatively influence owl occupancy over time because thickets of small shade tolerant trees decrease foraging success (Blakesley et al 2005).

According to current literature regarding productivity and survivorship of spotted owls, several studies have suggested that there is a direct relationship between the amount of high quality habitat (greater than 50 percent canopy closure) in close proximity to the nest stand and reproduction (Verner et al. 1992, Bart 1995, Hunsaker et al. 2002, IN: USDA 2001). However, recent research suggests that the proportion of high (70-100 percent) to intermediate density canopy cover (40-69 percent) within an owl territory is not as important as the total overall amount of the territory that is composed of intermediate or highly dense canopy cover for spotted owl production (Lee and Irwin 2005). Based on the CWHR habitat model, PACs/HRCAs in the TRRP Project area are comprised of stands with moderate to high canopy cover. Table 31 displays available habitat within each PAC and HRCA by Owl Site ID, the percent overlap with the project area, total PAC/HRCA acres, total PAC/HRCA acres in suitable habitat types, and the predicted CWHR habitat suitability scores based on existing condition.

Table 31: Amount of California Spotted Owl PAC and HRCA Overlap with the TRRP Project

Owl Site ID Number	PAC/HRCA	PAC/ HRCA Overlap with TRRP (percent)	Total PAC/HRCA Acres	PAC/HRCA Suitable Habitat (4M, 4D, 5M, 5D, 6) (Acres)	Existing CWHR Habitat Suitability Score (2010)
TUL0028	**PAC**	0	307	307	0.953
	HRCA*	0	658	658	0.813
TUL0201	**PAC**	39	366	302	0.762
	HRCA	40	712	602	0.653
TUL0173	**PAC**	11	372	300	0.543
	HRCA	50	732	611	0.688
TUL012	**PAC**	23	331	308	0.849
	HRCA	48	638	604	0.849
TUL013	**PAC**	77	347	316	0.677
	HRCA	50	635	600	0.625

* HRCA acres include acres encompassed by the PAC and an additional 300 acres.

Research indicates that population growth rate for the spotted owl is highly correlated with weather variability, as well as being sensitive to suitable habitat quality where dense high quality habitat shelters owls from the adverse effects of weather (Seamans 2005; North et al. 2000; Lee and Irwin 2005). Lee and Irwin (2005) determined that owls tend to attempt nesting more frequently in higher quality habitat.

Home range size was also found to vary depending on primary prey availability. Spotted owl home ranges in areas where the primary prey is northern flying squirrels were found to be consistently larger than those where the primary prey consisted of dusky-footed woodrats. It has been suggested the smaller home range size associated with this phenomena may result because woodrats occur in greater densities and weigh more than flying squirrels (Zabel et al. 1992).

Prey Resources: Spotted owls detect their prey by sight and sound, generally pouncing on their prey from an elevated perch or capturing it mid-air. Prey items documented in their diet include a diversity of mammals (gophers, mice, squirrels, bats), birds, reptiles (lizards, frogs), and insects. Several studies suggest that the owl is a prey specialist because although they feed on a variety of taxa, much of their diet is comprised by one or two species. In the upper elevation conifer forest for example, the flying squirrel (*Glaucomys sabrinus*) is dominant in the diet comprising as much as 61 to 77 percent of the biomass eaten in some localities and seasons (Verner et al. 1992). In contrast, in mid and lower elevations of the Sierra Nevada, the primary prey species is the dusky-footed woodrat (*Neotoma fuscipes*) making up 74 to 94 percent of the diet, by weight, in various areas (Verner et al. 1992, Thrailkill and Bias 1989).

Based on limited pellet collections and analysis taken from under nest and roost locations in the TRRP Project Area, both the flying squirrel and dusky-footed woodrat were found to occur in their diet. Other prey species identified included various small birds, small mammals, bats and insects.

<u>Fisher (*Martes Pennatti*)</u>

Distribution, status and Trend: The fisher's distribution in California was described by Grinnell et al. (1937) which included a continuous arch from the northern Coast Range eastward to the southern Cascades, and south through the western slope of the Sierra Nevada. Fisher historically occurred in the Lassen, Plumas, Tahoe, Lake Tahoe Basin, Eldorado, Stanislaus, Sierra and Sequoia National Forests, but was not known to occur in the Modoc, Inyo or Humboldt-Toiyabe National Forests. Today, fisher distribution in California remains in only two areas of the State: populations found in northwestern California, and those in the southern Sierra Nevada extending from Yosemite National Park southward. These two populations are separated by a distance of approximately 250 miles (Zielinski et al. 1995).

In 2004 the U.S. Fish and Wildlife Service (USFWS) completed a 12-month status review of the fisher and determined that the West Coast Distinct Population Segment (DPS) warranted protection under the Endangered Species Act of 1976 et seq. but was precluded from listing by higher priority actions (Federal Register Vol. 69 No. 68, April 8, 2004) (USDI-FWS, 2004), making this fisher DPS a candidate for listing. The USFWS has annually reviewed this finding and monitored the status of the fisher, as required under 16 U.S.C. 1533(b)(3)(C)(i) and (iii), as reflected in the annual Candidate Notices of Review (CNORs). In March 2013, the USFWS initiated a status review as part of a multidistrict litigation settlement agreement under which the Service agreed to submit a proposed rule or a not-warranted finding to the *Federal Register* for the West Coast DPS of the fisher no later than the end of fiscal year 2014 (In re Endangered Species Act Section 4 Deadline Litigation, Misc. Action No. 10-377 (EGS), MDL Docket No. 2165 (D.D.C.). The settlement agreement also provided that if the USFWS pursued listing of the West Coast DPS of the fisher, they would also concurrently designate critical habitat for that DPS. The West Coast Fisher DPS (USDI-FWS, 2004), includes all potential fisher habitats in Washington, Oregon and California from the east side of the Cascade Mountains and Sierra Nevada to the Pacific coast. Per Forest Service policy, this species will continue to be managed as Forest Service sensitive species until the final listing is proposed, reviewed, and published in the *Federal Register*.

Long term status and trend monitoring for fisher and marten was initiated by the Forest Service in 2002 as part of the Sierra Nevada Forest Plan Amendment FEIS (USDA 2001); the monitoring objective is to be able to detect a 20 percent decline in population abundance and habitat (USDA 2006). The monitoring design includes intensive sampling to detect population trends on the Sierra and Sequoia National Forests, and is supplemented by less intensive sampling in suitable habitat in the central and northern Sierra Nevada specifically designed to detect population expansion.

Occupancy rates reported from long term status and trend monitoring from 2002 thru 2009 (Table 32) suggest that there has been no conspicuous difference in occupancy rates among years, and no seasonal effects on detection probabilities within the June to October sampling periods (Truex, et al.,2009, Zielinski et al. 2013). Preliminary proportions of number of sample sites with fisher detections divided by the number of sites surveyed from 2002 to 2009 are presented in Table 32.

Table 32: Naïve (observed) Occupancy Rates of Fisher in the Sequoia and Sierra National Forests Based on Long-term Status and Trend Monitoring Results (2002-2009)

Year	Sequoia NF West Slope	Sequoia Kern Plateau[a]	Sierra NF	Entire Area
2002	0.353	0.167	0.217	0.252
2003	0.483	0.133	0.200	0.281
2004	0.390	0.214	0.113	0.207
2005	0.514	0.294	0.155	0.291
2006	0.508	0.185	0.170	0.276
2007	0.540	0.222	0.142	0.262
2008	0.392	0.143	0.181	0.241
2009[b]	0.514	0.462	0.118	0.259

[a] (Updated 3/11/2010) USDA Forest Service 2009, Truex et al. 2009, Truex, pers. comm.. 2010. Geographic areas are defined as Sequoia NF West Slope (including Hume Lake Ranger District), Sequoia Kern Plateau (the Kern Plateau portion of Sequoia National Forest), and Sierra (Sierra National Forest). Habitat availability and detection rates on the Kern Plateau may be affected by habitat loss due to large fires.

[b] Sampling effort during 2009 was reduced on the Kern Plateau due to safety and operational considerations. Sampling was limited to the northern portion of the plateau and the observed occupancy is likely higher than it would otherwise have been if sampling had occurred throughout the area as in previous years (Truex, pers. comm.).

From 2002 thru 2008, 439 sites were surveyed throughout the Sierra Nevada on 1,286 sampling occasions, with the majority of the effort (greater than 80 percent of all sampling) occurring within the fisher population monitoring study area. Fishers have been detected at 112 of 251 (44.6 percent) sites sampled during the seven monitoring seasons (USDA 2008c). Of these 251 sites, 203 (80.8 percent) have been sampled at least three years (112 on Sierra NF, 62 on the west slope Sequoia NF, and 29 on the Kern Plateau). For sites that have been sampled at least three years, the overall occupancy pattern can be characterized as either:

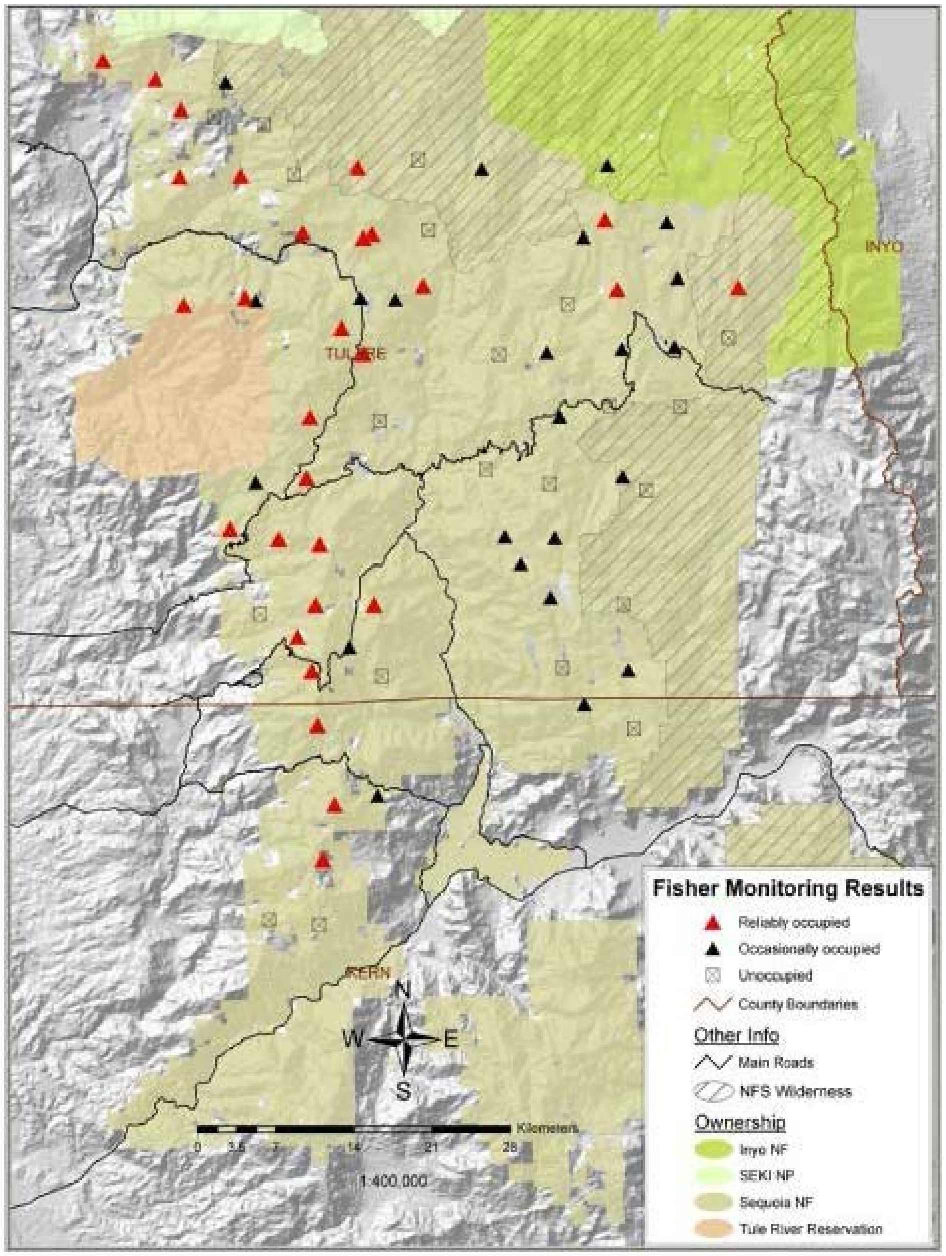
1. Reliably occupied: fisher detected 50 percent or greater of years sampled.
2. Occasionally occupied: fisher detected at least one year, but less than 50 percent of the years sampled
3. Unoccupied: fisher never detected.

Examining the distribution of detections using these definitions reveals that fishers are reliably detected most often on the west slope of Sequoia National Forest, where 31 of 62 sites sampled three or more years have detected fisher at least half of the years surveyed (Figure 16). On the Kern Plateau, only three of the 29 sites meet the criteria to be considered reliably occupied, while more than half are characterized as occasionally occupied (USDA 2008c). Fishers have not been detected in the northern, central, or eastern Sierra Nevada.

The southern Sierra Nevada mountain range provides habitat for the southernmost population of fishers in the world. Maintenance of this sub population may be critical to conserving fisher throughout the broader western United States (Zielinski 2004) because it appears to support unique genetic and behavioral adaptations to extreme environmental conditions for this species. Previous studies revealed genetic patterns that appeared to arise from the disjunct nature of fisher population distributions in the Pacific States, and pointed to reduced genetic diversity in this population. Additionally, the Kings River was believed to provide a physical barrier restricting northern movement of fisher from the southern Sierra population, and perhaps permeable to just one migrant every 50 generations (Drew et al. 2003, Wisely et al. 2004). The principles of conservation biology dictate that for a population to maintain genetic diversity there should be at least one migrant every 20 generations. Thus, these results were cause for significant concern.

However, new preliminary data indicate that at least one individual per generation moves from the northwest Sierra to the central population group, and up to 3.5 individuals per generation are interchanged between the central and southern genetic group, allaying concerns regarding presence of significant barriers to movement (Tucker et al. 2009). Thus, the Kings River does not appear to constitute a barrier to fisher movement, as previously proposed. In addition, Knaus et al. (2011) found that fishers in the southern Sierra are genealogically distinct from other fisher populations and likely were separated prior to the advent of modern land management practices.

Figure 16: Long-term Status and Trend Fisher Monitoring Sites and Results in Sequoia National Forest



Habitat Preference and Biology: The Sierra Nevada status and trend monitoring (USDA 2006) has detected fishers as low as 3,110 feet and as high as 9,300 feet in the southern Sierra Nevada, however, these values are thought to represent the extremes of their elevation range. Mapped female fisher home ranges (Tule River Study) from the upper Tule River basin were found between 3,600 and 7,500 feet in elevation. Males appear to have a much wider range in elevation, 4,000 to 9,300 feet, but also appear to be much less selective in use of habitat in general (Zielinski et al. 2004). It is expected that this elevation range will vary by latitude and corresponds generally to the lower end of the mixed conifer hardwood cover type at the lower end and the red fir cover type at the upper elevation.

CWHR assigns habitat values for fisher according to expert panel ratings. Using the CWHR2.1 model, there is an estimated 149,464 acres of moderate to high suitability habitat in the Monument. There is an estimated 2,295 acres of suitable habitat in the TRRP Project area.

Table 33: CWHR High and Moderate Capability Habitat for Fisher (CWHR2.1)

CWHR2.1 Habitats	CWHR2.1 High and Moderate Capability Size, Canopy Cover, and Substrate Classes
Jeffrey pine	4P, 4M, 4D, 5P, 5M, 5D *
montane hardwood-conifer	4P, 4M, 4D, 5S, 5P, 5M, 5D, 6
montane hardwood	4M, 4D, 5M, 5D, 6
Ponderosa pine	4P, 4M, 4D, 5P, 5M, 5D
Sierran mixed conifer	4P, 4M, 4D, 5S, 5P, 5M, 5D, 6
white fir	4P, 4M, 4D, 5S, 5P, 5M, 5D, 6

*See Table 22 on page 70 for a description of size and density classifications.

Fishers use large areas of primarily coniferous forests with a fair amount of structural complexity contributed by dense overlapping canopy, large live trees, snags, and down logs. A vegetated understory and large woody debris appear important for their prey species. It is assumed that fishers will use patches of quality habitat that are interconnected by other forest types, whereas they will not likely use patches of habitat that are separated by large open areas lacking canopy cover (Buskirk, et al., 1994).

The decrease of understory vegetation in fuels reduction and silviculture treatments may reduce prey abundance and availability, as well as the availability of vegetative foods like berries and seeds. However, the recovery of understory vegetation takes less time than the development of other structural features important for fishers like large overstory trees and snags (Naney et al. 2012). Vegetation treatments that create within-stand heterogeneity of understory vegetation can increase habitat suitability for a number of species including the fisher (Wilson and Puettmann 2007).

Riparian corridors (Heinemeyer, et al., 1994) and forested saddles between major drainages (Buck, 1983) may provide important dispersal habitat or landscape linkages for the species. Riparian areas are important to fishers because they provide concentrations of large rest site elements, such as broken top trees, snags, and coarse woody debris (Seglund, 1995), perhaps because they persisted in the mesic riparian micro-topography through historic fires.

Home Range and Territoriality: Estimates for fisher home range size were taken from studies on the Sierra and Sequoia National Forests as displayed in Table 34 to gain a picture of the size range expected for males and females in the southern Sierra Nevada. Male and female fisher home ranges established through the Tule River Study located on the Western Divide District were calculated for 12 focal fishers (4 males and 8 females). Several key findings noted by Zielinski et al. 2004b, were that male home ranges were larger than females, and that in comparison to other studies throughout California, females had the smallest home range size (Table 34). Zielinski suggested this likely reflected higher habitat quality due to greater abundance of black oak that provides cavities and prey food resources.

Vegetative composition for female home ranges included Sierran mixed conifer, ponderosa pine and montane hardwood-conifer, while male fisher home ranges were composed primarily of Sierran mixed conifer, ponderosa pine, red fir, and montane hardwood. Zielinski (et al. 2004b) suggested that these differences between sexes in composition reflected females' selection of lower elevation, higher quality habitats and males need to traverse higher elevation habitat in order to access multiple females.

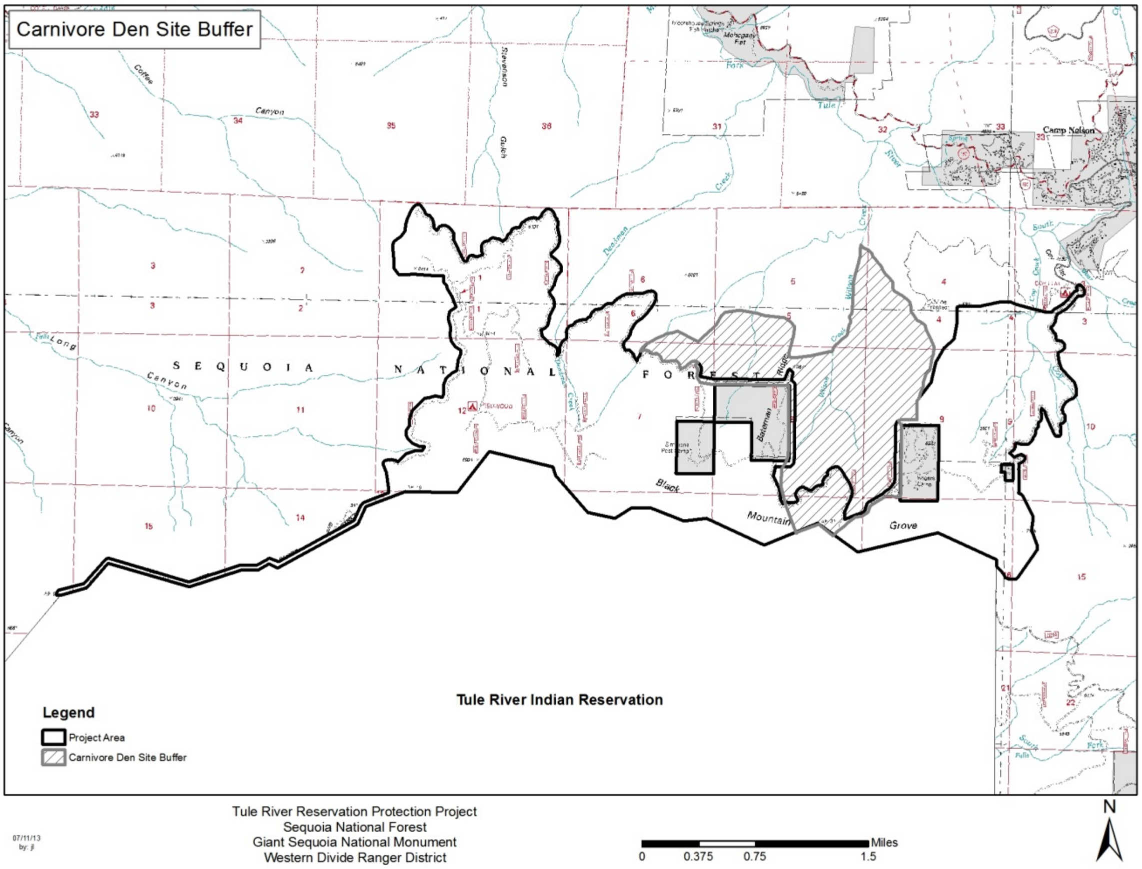
Table 34: Average Fisher Home Range Sizes in the Southern Sierra Nevada Mountains

Southern Sierra Nevada National Forest	MEAN MALE Home Range (acres)	MEAN FEMALE Home Range (acres)	Source
Sequoia	9,855[a]	1,644[a]	Zielinski et al. (1997)
Sequoia	7,409[d]	1,304[d]	Zielinski et al. (2004b)
Sequoia NF Mean	8,632	1,474	Arithmetic Mean
Sierra	6,511	2,708	Thompson et al. (2011)[b]
Sierra	5,421	2,945	Mazzoni (2002)[c]
Sierra	23,524	5,659	Sweitzer (2011)[e]
Sierra NF Mean	11,819	3,771	Arithmetic Mean

[a] Mean of two home range estimating techniques: 95 percent minimum convex polygon, and adaptive kernel.
[b] 95 percent fixed kernel estimates based on 14 male and 46 female territories.
[c] 95 percent Minimum convex polygon estimate
[d] 100 percent Minimum Convex Polygon method
[e] 95 percent fixed kernel estimates based on 17 male and 30 female territories.

The majority of the documented female home ranges occurred toward the bottom of the Tule River Basin, at elevations lower than the TRRP Project. However one female den location was found approximately ¼ mile down slope outside of the TRRP Project area north east of a private inholding. Den buffers were established for all known female den sites located as part of the Tule River Study. Approximately 125 acres of one of these fisher den buffers overlaps the TRRP Project area (Figure 17).

Figure 17: Carnivore Den Site Buffers in the Vicinity of the TRRP Project



Habitat suitable for resting and denning sites is thought to be most limiting to the population; therefore, these habitats should be given more weight than foraging habitats when planning or assessing habitat management (Powell, et al., 1994), (Zielinski, et al., 2004b). Recent research studies in the southern Sierra Nevada have provided information on habitat use by fisher for rest and den sites. Mazzoni (2002) studied habitat in the Kings River Project (KRP) on the Sierra National Forest. Ninety percent of fisher rest sites were in large live trees (mean dbh of 37 inches) and large snags (mean dbh of 40 inches). Purcell et al. (2009) evaluated data from the KRP study area from 2007 to 2011. Rest sites of all trees averaged 34.9 inches dbh, ranging from 7.8 inches to 78.4 inches dbh (N=283). Conifers used as rest sites averaged 37.6 inches dbh while hardwoods averaged 27.9 inches dbh (C.Thompson pers. Comm). Most resting structures occurred in live trees (76 percent), 15 percent were in snags, three percent were in logs, and two percent each were in stumps and rock crevices (Purcell et al. 2009). Mean canopy cover as measured by moosehorn at rest sites was 73.7 percent, compared to random canopy cover of 55.3 percent (Purcell et al. 2009). Zielinski et al. (2004b) argue that retaining and recruiting trees, snags and logs of at least 39 inches in diameter, encouraging dense canopies and structural diversity, and retaining and recruiting large hardwoods are important for producing high quality fisher habitat and resting/denning sites.

In the Tule River Study, fisher were found to rest in both conifer and hardwood trees (N=317)(derived from Truex et al. 1998). Large diameter black oaks and canyon live oaks comprised almost half of the rest sites (N=146) with a mean dbh of 25.6 inches. In contrast, conifers used (N=181) had a mean dbh of 40.2 inches. Mean basal area found at rest sites was 279 sq.ft./acre (range 163-395 sq.ft/acre).

Den site structural elements must exist in the proper juxtaposition within specific habitats in order to provide a secure environment for birth and rearing of fisher kits. Natal dens, where kits are born, are most commonly found in tree cavities at heights of greater than 20 feet (Lewis, et al., 1998). Maternal dens, where kits are raised, may be in cavities closer to the ground (Ibid).

Den tree data collected in the KRP area on the Sierra National Forest between 2007 and 2010 (Thompson et al. 2011), included use of black oak, white fir, incense cedar, ponderosa pine, and sugar pine. Live black oaks selected as maternal den sites were among the largest oaks used and averaged 34.2 inches dbh, while oaks used as maternal den sites were much smaller and averaged 23.6 inches dbh. Live conifers used as natal dens averaged 45.2 inches, while those used as maternal dens were smaller, averaging 37.9 inches dbh. Forty-four of 93 maternal and natal dens (47 percent) were in black oaks, which do not typically leaf out until mid–late May, thus providing little canopy cover during actual use periods. Selection of these sites may be driven by their location and associated access to warming morning sun (K. Purcell, pers. comm.) (C. Thompson pers. comm). All confirmed births through the 2008 field season occurred between 30 March and 11 April, and natal dens were occupied for two to eight weeks.

Natal and maternal dens located in the Tule River Study on the Sequoia National Forest were in large conifers or oaks, generally in live form (Truex, et al., 1998), (Zielinski, et al., 2004b). The mean dbh of conifers in den sites was 49.4 inches, compared to only 26.3 inches in black oak. A review of available literature and anecdotal information was used to develop an estimate of forest structure used by a given fisher during their lifetime. Obviously, these numbers are somewhat speculative, but this provides what we consider to be a minimum number of resting structures that need to be available to fishers post-project. Given that fishers generally use at least one rest site per day, and have been reported to reuse only about 14 percent (range of 3-27 percent) of rest site structures (Seglund, 1995) (Self, et al., 2001) (Mazzoni, 2002) (Zielinski, et al., 2004b), (Yaeger, 2005), (Aubry, et al., 2006), this equates to a minimum of 314 rest trees needed per an average southern Sierra Nevada female home range (2,357 acres) annually. Reproductive females also utilize up to five den sites per year for a cumulative total of 319 potentially suitable trees needed per home range (or 0.14 trees per acre). The mean life span for fishers is approximately 10 years, equating to a minimum of 1.4 suitable rest/den trees needed per acre for each female home range over an average life span. Males would also require an estimated 314 rest sites, and with a mean home range of 9,518 acres this equates to 0.3 trees per acre over an average lifetime. Thus for an area to provide sufficient male and female rest and den site trees, more than 1.7 trees per acre are required. Because we don't know what factors influence a fisher to decide to rest in one location versus another, there is a need to provide sufficient alternate rest and den tree choices to compensate for our lack of knowledge. Therefore we choose to buffer the 1.7 trees per acre by a factor of ten (selected to ensure availability of many more rest structures than are actually used) to maintain up to 17 potential resting/denning trees per acre, where they exist. The number of trees/acre needed to meet the demand for potential rest/den trees should be at least 24 inches dbh or greater in size to provide an adequate recruitment pool for future use. Based on stand exam data for all modeled habitat types, there is a weighted average of 19 trees/acre greater than 24 inches dbh in the TRRP Project Area.

Prey Resources: Fishers have been identified by most researchers as habitat specialists but dietary generalists and opportunistic in their foraging strategy (Ruggeriero et al. 1994, Martin, IN Buskirk et al. 1994, USDI 2004). Some authors suggest that their ability to adjust predatory patterns and prey type are important factors that enable them to balance energetic needs (Buskirk and Powell 1994). Fisher eat a wide diversity of prey items, which include small to mid-sized mammals, birds, fruits and nuts, vegetation, and carrion.

Vegetation Manipulation to Reduce Risk of Uncharacteristically Severe Wildfire

Truex and Zielinski (Truex, et al., 2005) developed fisher resource selection functions (RSF) and resource selection probability functions (RSPF) as described in Zielinski et al. (Zielinski, et al., 2004) to compare rest sites selected and track plate detections to areas not selected or sampled with no detections. These RSFs were used to estimate the change in fisher habitat suitability pre- to post-treatment in fuels reduction projects at two sites in the Sierra Nevada. The remainder of this section discusses the results of the Truex and Zielinski (Truex, et al., 2005) study.

Four primary treatments were applied for effects assessment: control (no treatment); mechanical harvest (usually including mastication following harvest); mechanical harvest followed by prescribed burning; and an area where prescribed burning was the only treatment. Study areas were the Blodgett Forest Research Station (BFRS) and a satellite site at Sequoia-Kings Canyon National Park (SEKI).

This study generally concluded that fire and fire surrogate treatments have modest but significant short-term effects to the quality and availability of fisher resting habitat, as well as canopy closure. At BFRS, mechanical as well as mechanical plus fire treatments significantly reduced fisher resting habitat and average canopy closure. At the SEKI site, the late season burn treatment had a significant effect on fisher habitat suitability as well as canopy closure. The short-term treatment effects to foraging habitat at both sites were generally not significant. This may be explained by the broad spectrum of foraging habitat parameters, rendering it less likely to be a limiting factor to fisher than resting habitat.

Although the mechanical and mechanical/fire treatments had greater effects on fisher resting habitat suitability than prescription fire at BFRS, these effects can be mitigated by the ability of mechanical treatments to avoid individual habitat elements such as the critically important hardwoods and large trees. The use of prescribed fire alone can be mitigated by raking debris away from key fisher structural elements in the habitat. The effect of greatest magnitude was a reduction in canopy closure. All treatments reduced canopy closure. Canopy closure, however, recovers relatively quickly compared to the loss of large dead or live trees. Re-measurements of treatment units in this study in 5 or 10 years will provide information on how quickly the canopy actually recovers.

Interpretation of these results needs to be cautious and informed by more data in the next decade. In areas where fisher habitat suitability is already low or marginal, the predicted effects may have a disproportionately large impact to habitat recovery. On the other hand, the short-term negative effects of the treatments may result in beneficial effects on subsequent stand development. Future monitoring will be needed to elucidate the exact nature of this relationship.

Another limitation of this study is that it focused upon effects at the individual stand level. As wide-ranging predators, fisher function at larger landscape scales within their habitats. Thus, it is important to analyze the spatial and temporal array of treatments in a landscape context. The more broadly distributed the treatments are over space and time, the lower the likelihood of significant negative effects in a landscape context. It seems likely that such treatments distributed over space and time should have lower impacts than large-scale catastrophic wildfire.

One last caveat offered by Truex and Zielinski (2005) in interpreting the study results is to recognize that a reduction in habitat suitability does not necessarily equate to loss of suitability. Population level implications to localized reductions in habitat suitability have yet to be studied. To decrease effects to fisher habitat suitability, the authors recommend planning treatments to maintain elements important to fisher (e.g. large diameter hardwoods). Early season burns (mid-May or later) timed to follow the fisher denning period seem to have less impact to habitat. However, K. Purcell and C. Thompson (pers. comm.) have noted that by mid-May the kits still have relatively limited mobility; they are still largely dependent on the female until the end of August. Thus, to avoid potential conflict with denning, early season burns (spring burns) should occur prior to mid-March. Planning treatments to occur dispersed over space and time to the extent possible will minimize the effect to individual fishers.

Marten (*Martes americana*)

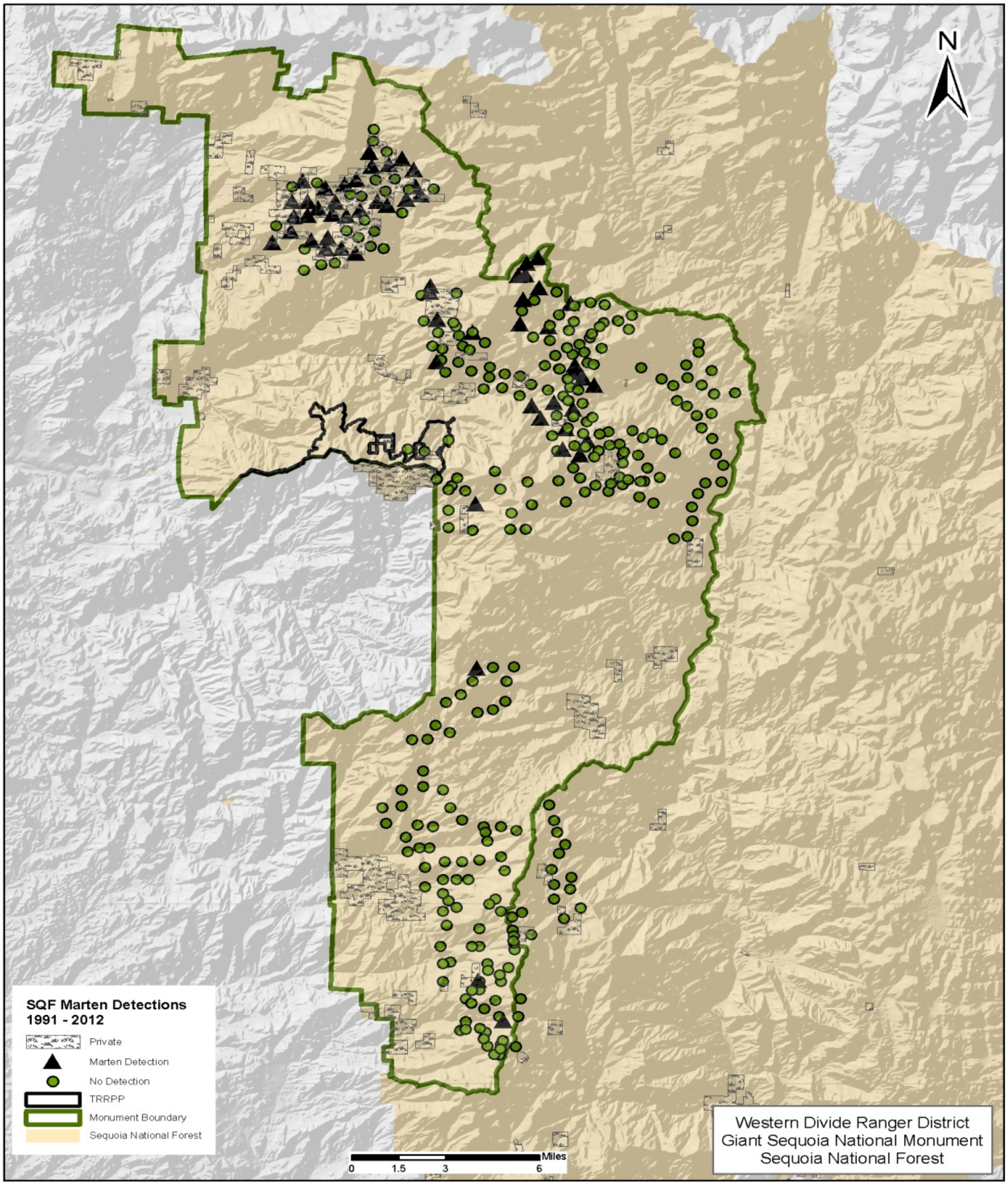
Distribution, Status and Trend: Marten are currently distributed in the Sierra Nevada and Cascades (Buskirk and Zielinski 1997) between the elevations of 5,500 to 10,000 feet, but in the Sierra Nevada are most often are found above 7,200 feet (Cablk and Spaulding 2002). For example, 81 percent of the 31 marten detected over an eight-year study on the Stanislaus National Forest were recorded at elevations above 6,562 feet. In the Tule River Study conducted in the upper Tule River Basin on the Western Divide Ranger District, marten were found to slightly overlap in their distribution with fisher. The mean elevation of marten detections at track plate stations was 6,535 feet (N=18). In other track plate surveys conducted at higher elevations above the study site, marten were detected more frequently than fisher.

There have been no formal estimates made regarding current marten population size or density for the Sierra Nevada. However, available information suggests that marten remain well-distributed in the Sierra Nevada above 7,200 feet in elevation, and sporadically distributed at lower elevations.

Distribution within Sequoia National Forest and TRRP Project Area: Marten distribution on Sequoia National Forest extends from the middle of the Greenhorn Mountains near the Kern Tulare County border north through the Western Divide District including the western portion of the Golden Trout Wilderness through the Hume Lake District. The California Natural Diversity Database also showed sporadic historic detections of marten on the Kern Plateau prior to 1989, however, there have been no confirmed detections of marten in more recent surveys. Data from localized surveys and long term status and trend monitoring as part of the SNFPA (USDA 2001) show most marten detections occur from mid slope and higher within the upper Tule River basin (Figure 18).

Prior surveys have not detected occurrence of marten in the TRRP Project Area, although suitable CWHR habitats are present. This may be the result of the elevation range found within the project area. In other parts of the upper Tule River Basin there is a continuous upslope gradient which culminates at higher elevations into red fir habitat, a preferred vegetation type for the marten. The lack of adjoining upslope red fir or meadow environments in the TRRP Project Area likely lowers the habitat suitability for the marten.

Figure 18: Marten Survey Points and Detections in the Tule River Basin from 1991 through 2012



Habitat Preference and Biology: Marten habitat includes mature conifer forests interspersed with meadows, providing abundant small mammal prey, features for resting and denning, and sufficient canopy cover for protection from avian predators (Buskirk and Ruggiero 1994). Based on the CWHR model (2005), the habitat stages that provide moderate to highly important habitat for the marten include 4M, 4D, 5M, 5D, and 6 within red fir, lodgepole pine, subalpine conifer, Sierran mixed conifer, Jeffrey pine, and eastside pine. Using the CWHR model, there are 139,131 acres of high suitability habitat for marten in the Monument, with an estimated 2,060 acres of suitable habitat within the TRRP Project analysis area.

Where the marten's geographic range contains a mixture of moist and dry forests, moist environments are favored over those with drier site conditions. Several studies suggest marten prefer forest habitats which contain large diameter trees and snags, large down logs, and moderate-to-high canopy closure. Buskirk and Powell (1994) for example suggested that marten tend to utilize stands that are complex structurally, and which have denser (although not uniform) overhead canopy cover. In the northern Sierra Nevada, marten selected stands with 40 to 60 percent canopy closure for both resting and foraging, and avoided stands with less than 30 percent canopy closure (Spencer et al. 1983). Koehler et al. (1975) also indicated that marten avoid stands with less than 30 percent canopy cover; however, Bull et al. (2005) in northeast Oregon found marten avoided stands with less than 50 percent canopy cover. While martens may prefer use of forests that provide at least moderate-to-dense overhead cover, some individual tolerance seems to exist for occasional use of more open environments. Marten have been noted to cross small openings, narrow road prisms, and to travel and forage along forest/meadow edge environments, and within burn areas (Koehler and Hornocker 1997, Buskirk and Powell 1994). Cablk and Spalding (2002) snow-tracked marten at the Heavenly Ski Resort (Lake Tahoe) and found that where marten were detected, the mean canopy closure was only 30 percent as marten frequently crossed and foraged within open ski runs. It's generally speculated that forests that provide low overhead canopy (less than 30 percent), or which contain large open areas devoid of shrub or overstory trees are avoided because they present an increased risk for predation from avian predators (Buskirk and Powell 1994, Bissonette et al. 1988, Allen 1982).

Dead and down material such as large snags, large downed woody material, and debris piles (especially near the ground) appear to provide protection from predators, serve as prey sources, provide access to below snow spaces for winter hunting, and protective thermal cover especially in the winter (Buskirk and Powell 1994, Spencer et al. 1983, Thompson and Harestad 1994, Bull et al. 2005). Large down woody debris are an important habitat component for both resting/denning and foraging. In the Southern Sierra Fisher and Marten Study (Zielinski et al. 1995, unpublished Progress Report III), marten rested most commonly in structures near the ground including logs, rocks and rock outcroppings, rootwads, and burrows. Zielinski et al. (1995) also found that tree rest sites were used more often in winter than summer. The SNFPA FEIS offered tentative estimates for key component thought to be important for marten in westside suitable habitats (Table 35).

Table 35: Key Component Estimates for Westside Suitable Marten Habitat (SNFPA FEIS)(USDA 2001)

Habitat Element	Westside Habitats	
	Travel/Forage	Denning/Resting
Canopy Cover	>=40 percent	>=70 percent
Largest Live Conifers	>=24"dbh, >=6/acre	>=24"dbh, >=6/acre
Live Tree Basal Area		163-350 sq ft/acre
Largest Snags	Ave 2.5/acre >=24" dbh	Ave 5.0/acre >=24" dbh
Coarse Woody Debris	Largest logs (>15 ft long) for 5-10 tons/acre in Decay Classes 1-3	Largest logs (>15 ft long) for 5-10 tons/acre in Decay Classes 1-2

Home Range and Landscape: Home range areas for marten in the southern Sierra Nevada (Sequoia, Sierra and Stanislaus National Forests) were estimated at 254 acres for females and 807 acres for males (USDA 2001). Marten give birth to their young between mid-March and late April. Two types of dens are recognized in the literature: natal dens, in which the birth of young occurs, and maternal dens, which are occupied by the mother and young but, are not whelping sites (Ruggiero et al. 1994). A variety of structures are used for dens, which include trees, logs, and rocks accounting for 70 percent of the structures reviewed by Ruggiero et al (1994). In all cases involving standing trees, logs and snags, dens were found in large structures. Canopy cover and the number of large old trees in these patches typically exceed levels available in surrounding habitat.

At the landscape scale, patches of preferred habitat and the distribution of open areas with respect to these patches may be critical to the distribution and abundance of martens (Buskirk and Powell 1994). Small open areas, especially meadows, and regenerating stands (or plantations) are used by marten as foraging habitat, but these openings are of optimum value when they occupy a small percent of the landscape and occur adjacent to mature forest stands meeting requirements for denning or resting habitat.

Prey Resources: Marten have been identified by most researchers as habitat specialists but dietary generalists and opportunistic in their foraging strategy (Ruggeriero et al. 1994, Martin, IN Buskirk et al. 1994, USDI 2004). Some authors suggest that their ability to adjust predatory patterns and prey type are important factors that enable them to balance energetic needs (Buskirk and Powell 1994). Marten eat a wide diversity of prey items, which include small to mid-sized mammals (voles (*Microtus spp*.), Douglas squirrels (*Tamiasciurus douglasii*), deer mice (*Peromyscus spp*.) birds, insects (wasps, hornets and yellow jackets), fruits and nuts, vegetation, and carrion. Various studies in the Sierra Nevada indicate that martens have a strong preference for use of forest-meadow edges, and riparian forests appear to be important foraging habitats (Spencer et al. 1983, Martin 1987).

Pallid bat (*Antrozous pallidus*)

State Wide Range, Distribution and Trend: The pallid bat is a locally common species of low elevations in California. It is broadly distributed except for the high Sierra Nevada from Shasta to Kern Counties, and the northwestern corner of the State from Del Norte and western Siskiyou Counties to northern Mendocino County. The species occurs on all Sierra Nevada national forests. The entire Giant Sequoia National Monument is within the mapped CWHR range for this species.

There have been few bat surveys throughout Sequoia National Forest but pallid bats are presumed present in low density within their elevation range.

Global population trends are not well known but the species is ranked G5 (globally common, widespread, and abundant) by NatureServe (2014). State/provincial ranks are S1 or (Critically Imperiled) in British Columbia, Kansas, Idaho, and Wyoming; S2 (Imperiled) in Montana and Oregon; S2S3 in Washington; S3 (Vulnerable) in California, Oklahoma, and Nevada; S4 (Apparently Secure) in Colorado and Utah; S4S5 in Arizona; and S5 (Secure) in the Navajo Nation, Texas, and New Mexico. Urban expansion and private harvest of hardwoods have reduced foraging habitat at low elevations in California. Renewed mining on private lands have also contributed to the abandonment of roost sites.

Habitat Preferences and Biology: The pallid bat occupies a wide variety of habitats ranging from rocky arid deserts to grasslands, shrublands, woodlands, and forests from sea level up through mixed conifer forests. They are most abundant in the arid Sonoran life zones below 6,560 feet (Barbour and Davis 1969, Hermanson and O'Shea 1983, Pierson et al. 2001), but on rare occasion noted to occur up to 10,000 feet in the Sierra Nevada. Data suggests a stronger association with low to mid elevation oak habitat (both oak savannah and black oak), mixed deciduous/coniferous forest, and both coast redwood and giant sequoia forests (Pierson and Heady 1996, Pierson et al. 2006). At Yosemite National Park, reproductive populations have been detected in giant sequoia groves (Pierson et al. 2006). The pallid bat was one of the species most commonly encountered in giant sequoias in Giant Forest, Sequoia National Park (Ibid). They are yearlong residents in most of their range and hibernate in winter near their summer roost (Zeiner et al.1990). Occasional forays may be made in winter for food and water (Philpott 1997). Based on CWHR habitat classification of vegetation types (size and density) for the pallid bat there is approximately 5 acres of moderate to high suitability and 2,820 acres classified as low suitability habitat in the TRRP Project Area.

The pallid bat tends to be a roosting habitat generalist that utilizes many different natural and manmade structures (USDA 2001). Day roosts may vary but are commonly found in rock outcrops, crevices, tree hollows, mines, caves and a variety of human-made structures (bridges, buildings). Tree roosting has been documented in large conifer snags, inside basal hollows of live coastal redwoods and giant sequoias, and bole cavities in oaks. Cavities created by broken branches of black oak are very important and there is a strong association with black oak for roosting. Roosting sites must protect bats from high temperatures as this species is intolerant of roosts in excess of 104 degrees Fahrenheit. Pallid bats are also very sensitive to roost site disturbance (Zeiner et al. 1990, Philpott 1997). Night roosts are usually more open sites and may include open buildings, porches, mines, caves, and under bridges (Philpott 1997, pers. comm. Sherwin 1998, Pierson et al. 1996). The pallid bat is nocturnal and after sunset it emerges from the day roost to forage.

Mating takes place between late October and February. Pallid bats reproduce in nursery colonies of up to several hundred females, but generally fewer than 100. After a period of delayed fertilization, gestation occurs between April and June. On average 2 young are born between April and July, predominately May and June.

Prey Resources: Pallid bats are thought to prefer open habitat for foraging. They feed primarily on large, ground-dwelling arthropods, particularly beetles, Jerusalem crickets and scorpions (Pierson et al. 2006). Large moths and grasshoppers are consumed to a lesser degree. Pallid bats appear to be more prevalent within edges, open stands, particularly hardwoods, and open areas without trees (CWHR 2005).

<u>Fringed Myotis Bat (*Myotis thysanodes*)</u>

State Wide Range, distribution and Trend: The fringed myotis is found in western North America from south-central British Columbia to central Mexico and to the western Great Plains (Natureserve 2014). In California, it is distributed statewide except the Central Valley and the Colorado and Mojave Deserts (CWHR 2008).

In California, the species is found throughout the state, from the coast (including Santa Cruz Island) to greater than 5,900 feet in elevation in the Sierra Nevada. Records exist for the high desert and east of the Sierra Nevada. However, the majority of known localities are on the west side of the Sierra Nevada (Angerer and Pierson draft). Museum records suggest that while *M. thysanodes* is widely distributed in California, it is rare everywhere. Although this species occurs in mist-netting and night roost surveys in a number of localities, it is always one of the rarest taxa (Pierson et al. 1996). Available museum records offer documentation for only six maternity sites: two in Kern County (including the type locality at Old Fort Tejon), and one each in Marin, Napa, Tuolumne, and Tulare counties. Investigation of four of these sites since 1990 has shown that, while the roosts are still available, this species is no longer present at any of these sites (Angerer and Pierson draft).

According to Forest Service records, the fringed myotis is found on the Angeles NF, Eldorado, NF, Los Padres NF, Mendocino, NF, Modoc NF, Plumas, NF, Shasta-Trinity, NF, the Sierra NF, and the Tahoe NF. State records (CWHR 2008) add the Cleveland NF, Inyo NF, Klamath NF, Lake Tahoe Basin, Lassen NF, San Bernardino NF, Sequoia NF, Six Rivers NF, and Humboldt-Toiyabe NF.

Habitat Preferences and Biology: The fringed myotis bat occurs in dry woodland (oak and pinyon-juniper most common, Cockrum and Ordway 1959, Jones 1965, O'Farrell and Studier 1980, Roest 1951), hot desert-scrub, grassland, sage-grassland steppe, spruce-fir, coniferous and mixed deciduous/coniferous forests, including multi-aged sub-alpine, Douglas fir, redwood, and giant sequoia (O'Farrell and Studier 1980, Pierson and Heady 1996, Pierson et al. 2006, Weller and Zabel 2001). To generalize, this species is found in open habitats that have nearby dry forests and an open water source (Keinath 2004). Based on CWHR habitat classification of vegetation types (size and density) for the fringed myotis bat there is approximately 479 acres of moderate to high suitability and 2,436 acres classified as low suitability habitat in the TRRP Project Area.

This species has been associated with a variety of roost site types and structures. These include rock crevices (Cryan 1997), caves (Baker 1962, Easterla 1966, 1973), mines (Cahalane 1939, Cockrum and Musgrove 1964), buildings (Barbour and Davis 1969, O'Farrell and Studier 1980), bridges, and both live and dead trees. Day and night roosts in trees occur under bark, in tree hollows, and in snags of medium to large diameter (Keinath 2004; Weller and Zabel 2001). Studies conducted in California, Oregon, and Arizona, have documented roosts in tree hollows, particularly in large conifer snags (Chung-MacCoubrey 1996, Rabe et al. 1998, Weller and Zabel 2001, Pierson et al. 2006). Most of the tree roosts were located within the tallest or second tallest snags in the stand, were surrounded by reduced canopy closure, and were under bark (ibid.). In California, a small colony was located in a hollow redwood tree in the Carmel Valley. Tree roosting behavior is consistent with an observed association between this species and heavily forested environments in the northern part of its range.

This species often forages along secondary streams, in fairly cluttered habitat. It also has been captured over meadows (Pierson et al. 2001). The fringed myotis bat is known to fly during colder temperatures (Hirshfeld and O'Farrell 1976) and precipitation does not appear to affect emergence (O'Farrell and Studier 1975). Post-lactating females have been known to commute up to 13 km (8 miles) with a 930 meter (3,100 feet) elevation gain between a roost and foraging area (Miner and Brown 1996). Keinath (2004) found that travel distances from roosting to foraging areas may be up to five miles.

The fringed myotis consumes primarily beetles, and is supplemented by moths and fly larvae (Keinath 2004) captured in the air and on foliage (CWHR 2008). In a study conducted in New Mexico, Black (1974) concluded the species appeared to be a beetle strategist. In western Oregon (Whitaker et al. 1977), the dominant prey item in the diet of three out of four animals examined was Lepidopterans (moths). The diet also included phalangids (harvestmen), gryllids (crickets), tipulids (crane flies), and araneids (spiders). The feces of one individual captured on the upper Sacramento River in California contained predominantly coleopterans (beetles) and Hemipterans (bugs) (Rainey and Pierson 1996). Relatively heavy tooth wear on animals examined in a five year study on the Sacramento River would suggest that in this area the species feeds primarily on heavy bodied insects, such as Coleopterans and Hemipterans. The presence of non-flying taxa in the diet of the Oregon animals suggests a foraging style that relies at least partially on gleaning (Angerer and Pierson draft).

Management Indicator Species

According to the *Management Indicator Species Report for the Tule River Reservation Protection Project* (MIS Report) (Cordes 2014), Management Indicator Species (MIS) are animal species identified in the Sierra Nevada Forests MIS Amendment Record of Decision (ROD) signed December 14, 2007 (SNF MIS Amendment) (USDA 2007). Guidance for Forest Service resource managers regarding MIS is to: (1) at the project scale, analyze the effects of proposed projects on the habitat of each MIS affected by such projects, and (2) at the bioregional scale, monitor populations and/or habitat trends of MIS.

Project-level effects on MIS habitat involves examining the impacts of the proposed project alternatives on <u>MIS habitat</u> by discussing how direct, indirect, and cumulative effects will change the habitat in the analysis area.

These project-level impacts to habitat are then related to broader scale (bioregional) population and/or habitat trends. The appropriate approach for relating project-level impacts to broader scale trends depends on the type of monitoring identified for MIS in the forest level planning document. Hence, the Monument Plan identifies distribution population monitoring for an MIS, and the project-level habitat effects analysis for that MIS is informed by available distribution population monitoring data, which are gathered at the bioregional scale. The bioregional scale monitoring identified in the Monument Plan for MIS analyzed for the TRRP Project is summarized in Section 3 of the MIS Report.

Bioregional Monitoring Requirements for MIS Selected for Project-Level Analysis

The SNF MIS Amendment (USDA 2007) identifies bioregional scale habitat and/or population monitoring for the MIS for ten national forests, including the Sequoia. The applicable habitat and population monitoring requirements and results for the Sequoia's MIS are described in the 2010 SNF Bioregional MIS Report (USDA Forest Service 2010a) and are summarized below for the MIS being analyzed for the TRRP Project.

Habitat monitoring at the bioregional scale is identified for all the habitats and ecosystem components, including the following analyzed for the TRRP Project: shrubland, oak-associated hardwood and hardwood/conifer; early seral coniferous forest; mid seral coniferous forest; late seral open canopy coniferous forest; late seral closed canopy coniferous forest; and snags in green forest.

Populations of mule deer, mountain quail, sooty grouse, California spotted owls, American marten, northern flying squirrels and hairy woodpeckers are monitored at the bioregional scale using distribution population monitoring. Distribution population monitoring consists of collecting presence data for the MIS across a number of sample locations over time (also see USDA Forest Service 2001, Appendix E).

The MIS vegetation types in the TRRP Project Area and the surrounding Middle Fork Tule River watershed are described in Table 35.

Table 36: MIS Vegetation Types in the TRRP Project Analysis Area[a]

MIS Vegetation Types	Middle Fork Tule River Watershed (approximate acres)	TRPP Project Area (approximate acres)
Riverine and Lacustrine	4	0
Shrubland (west-slope chaparral types)	9,004	12
Oak-associated Hardwoods and Hardwood/conifers	18,777	479
Riparian	314	0
Wet Meadow	394	0
Early Seral Coniferous	2,050	283
Mid Seral Coniferous	20,585	689
Late Seral Open Canopy Coniferous	193[b]	65[b]
Late Seral Closed Canopy Coniferous	11,289[b]	1,278[b]

[a] The analysis area for each vegetation type overlaps the TRRP Project boundary and may encompass areas outside of the project boundary

[b] Does not include 30 acres of late seral coniferous forest with unknown canopy cover

The habitats and ecosystem components and associated MIS analyzed for the TRRP Project were selected from this list of MIS, as indicated in Table 36. In addition to identifying the habitat or ecosystem components (1st column), the CWHR type(s) defining each habitat/ecosystem component (2nd column), and the associated MIS (3rd column), the Table discloses whether or not the habitat of the MIS is potentially affected by the TRRP Project (4th column).

Table 37: Selected MIS for TRRP Project-level Habitat Analysis

Habitat or Ecosystem Component	CWHR Type(s) defining the habitat or ecosystem component[1]	Sierra Nevada Forests Management Indicator Species *Scientific Name*	Category for Project Analysis[2]
Riverine & Lacustrine	lacustrine (LAC) and riverine (RIV)	aquatic macroinvertebrates	2
Shrubland (west-slope chaparral types)	montane chaparral (MCP), mixed chaparral (MCH), chamise-redshank chaparral (CRC)	fox sparrow *Passerella iliaca*	3
Oak-associated Hardwood & Hardwood/conifer	montane hardwood (MHW), montane hardwood-conifer (MHC)	mule deer *Odocoileus hemionus*	3
Riparian	montane riparian (MRI), valley foothill riparian (VRI)	yellow warbler *Dendroica petechia*	2
Wet Meadow	Wet meadow (WTM), freshwater emergent wetland (FEW)	Pacific chorus frog *Pseudacris regilla*	2
Early Seral Coniferous Forest	ponderosa pine (PPN), Sierran mixed conifer (SMC), white fir (WFR), red fir (RFR), Jeffrey pine (JPN), tree sizes 1, 2, and 3, all canopy closures	mountain quail *Oreortyx pictus*	3
Mid Seral Coniferous Forest	ponderosa pine (PPN), Sierran mixed conifer (SMC), white fir (WFR), red fir (RFR), Jeffrey pine (JPN), tree size 4, all canopy closures	mountain quail *Oreortyx pictus*	3
Late Seral Open Canopy Coniferous Forest	ponderosa pine (PPN), Sierran mixed conifer (SMC), white fir (WFR), red fir (RFR), Jeffrey pine (JPN), tree size 5, canopy closures S and P	sooty grouse *Dendragapus obscurus*	3
Late Seral Closed Canopy Coniferous Forest	ponderosa pine (PPN), Sierran mixed conifer (SMC), white fir (WFR), red fir (RFR), Jeffrey pine (JPN), tree size 5 (canopy closures M and D), and tree size 6.	California spotted owl *Strix occidentalis occidentalis*	3
		American marten *Martes americana*	
		northern flying squirrel *Glaucomys sabrinus*	
Snags in Green Forest	Medium and large snags in green forest	hairy woodpecker *Picoides villosus*	3
Snags in Burned Forest	Medium and large snags in burned forest (stand-replacing fire)	black-backed woodpecker *Picoides arcticus*	1

[1] All CWHR size classes and canopy closures are included unless otherwise specified; **dbh** = diameter at breast height; **Canopy Closure classifications:** S=Sparse Cover (10-24 percent canopy closure); P= Open cover (25-39 percent canopy closure); M= Moderate cover (40-59 percent canopy closure); D= Dense cover (60-100 percent canopy closure); **Tree size classes:** 1 (Seedling)(<1" dbh); 2 (Sapling)(1"-5.9" dbh); 3 (Pole)(6"-10.9" dbh); 4 (Small tree)(11"-23.9" dbh); 5 (Medium/Large tree)(≥24" dbh); 6 (Multi-layered Tree) [In PPN and SMC] (Mayer and Laudenslayer 1988).

[2] **Category 1:** MIS whose habitat is not in or adjacent to the project area and would not be affected by the project.

Category 2: MIS whose habitat is in or adjacent to project area, but would not be either directly or indirectly affected by the project.
Category 3: MIS whose habitat would be either directly or indirectly affected by the project.

The following habitats occur within the analysis area (Middle Fork Tule River Watershed**)**, but are not affected by the TRRP Project: Riverine and Lacustrine, Riparian, Wet Meadow, and Snags in Burned Forest.

Riverine and Lacustrine: This habitat does not occur within the project area.

Riparian habitat: None occurs within the project area and this habitat would not be directly or indirectly affected by the project.

Wet Meadow: There is no wet meadow habitat within the project area and this habitat would not be directly or indirectly affected by the project.

Snags in Burned Forest: The TRRP Project is not a fire-salvage or fire restoration project, and there have been no recent stand-replacing fires in the project area. Therefore, black-backed woodpeckers do not have habitat in or adjacent to the project area and would not be affected by the project.

The MIS whose habitat would be either directly or indirectly affected by the TRRP Project, identified as Category 3 in Table 38, are carried forward in this analysis, which will evaluate the direct, indirect, and cumulative effects of the proposed action and alternatives on the habitat of these MIS. The MIS selected for project-level MIS analysis for the TRRP Project are: fox sparrow, mule deer, mountain quail, sooty grouse, California spotted owl, American marten, northern flying squirrel, and hairy woodpecker.

Chapter 4: Environmental Consequences

Reasonably Foreseeable Actions

Most past actions within this analysis area have occurred long ago and are considered part of the affected environment for most resources. One project that was recently completed is the Camp Nelson Project. The Camp Nelson Project reduced surface and ladder fuels by thinning trees up to 10 inches at diameter breast height (dbh), and contributes towards management desired conditions.

During a public field trip on the Tule River Reservation Protection Project (TRRP Project) a suggestion was made to decommission roads in the Black Mountain Grove. The suggestion is currently being reviewed by district personnel; and a purpose and need statement, and proposed action has not been developed to date. There are no other projects currently proposed that may impact the TRRP Project, which are reasonably foreseeable at this time.

Effects on Air Quality

The Forest will follow Title 17 of the California Code of Regulation – Subchapter 2, Smoke Management Guidelines for Agriculture and Prescribed Burning and Public Resource Code 4291 – for Hazard Reduction Burning in the foothill and mountain areas of the San Joaquin Valley Air Pollution Control District (SJVAPCD). Implementation of prescribed burning will only occur after approval from SJVAPCD. The conformity rule states “that the prescribed burns conducted in accordance with a smoke management program (SMP) which meets the requirements of EPA’s Interim Air Quality Policy on Wildland and Prescribed Fires or an equivalent replacement EPA policy" are considered as "presumed to conform." The EPA has approved California's revised Title 17 regulations as an equivalent of a SMP. Therefore, the project will fall under "presumed to conform" for implementing prescribed burning (*Tule River Reservation Protection Project Fire, Fuels, and Air Quality Report* (Fire and Air Quality Report) (Ernst 2014)).

Direct and Indirect Effects

Table 38 displays the estimated emissions for each alternative. Emissions were calculated using the SJVAPCD emissions reporting spreadsheet. For the no action alternative, Alternative 1, the existing condition with no fuel treatment was estimated to burn in a wildfire. Therefore, the emissions for Alternative 1 were estimated to be much higher than the other alternatives, and are likely to directly affect air quality in the smoke sensitive areas (Figure 4). Emissions were calculated for all years of implementation (up to 10 years). Slash piles and prescribed burning emissions were averaged across all acres treated for each alternative.

Table 38: Emissions Estimates for each Alternative in the TRRP Project

	Site Information					Emissions					
Alt	Fuel Type	Fire Type	Total Acres	Tons /acre	Total Tons	Tons PM10	Tons PM2.5	Tons NOx	Tons SO2	Tons VOC	Tons CO
1	Forest	Wildfire	2,840	39	11,076	1,356.8	1218.4	193.8	5.5	803.0	12,904
2	Slash Piles	Prescribed Fire	1,410	17	23,970	93.5	87.5	62.3	0.1	75.5	791
3	Slash Piles	Prescribed Fire	2,830	18	50,940	198.7	185.9	132.4	0.25	160.5	1,681

In Alternatives 2 and 3, the daily smoke emissions can be adjusted by implementing portions of the project over three to five years to prevent significant impacts to smoke sensitive areas (see Figure 4) or to avoid exceeding the 24-hour standards. Both action alternatives in this project would have segments that can be burned individually, or if conditions occur to take advantage of optimum burning conditions, more areas can be ignited within the same weather pattern. Target fuels would be burned when dry so they would be consumed quickly, and smoldering would be limited. Personnel on site would monitor smoke conditions, and mobile monitors (E-BAM) can be requested at smoke sensitive areas as needed.

Cumulative Effects

Short term smoke emissions would be low because no burning would occur in Alternative 1 until the occurrence of a wildfire. Over the long term, a wildfire is likely in the future and a large increase in emissions from smoke during a wildfire would be expected. (Schmidt et al. 2002).

Over the short term smoke emissions would be greater under the action alternatives due to pile, jackpot, and prescribed burning. However, over the long term, smoke emissions from future wildfires would be reduced. Cumulative smoke produced by prescribed burning and future low intensity fires occurring after fuel reductions would be less than smoke produced by high intensity wildfires that could occur where no fuel reductions have taken place.

This information is drawn from the Fire and Air Quality Report (Ernst 2014), which is hereby incorporated by reference.

Effects on Botanical Resources

Direct Effects

According to the *Biological Assessment for Federally Listed, Threatened, or Endangered Plant Species and Biological Evaluation for Forest Service Sensitive Plant Species and Noxious Weed Assessment* (Botany BA/BE) (Linton 2014) no positive or negative direct effects on sensitive plant species would occur under the No Action Alternative, Alternative 1.

In Alternatives 2 and 3, there would be incidental soil surface and herbaceous vegetation disturbance from the hand crew thinning and prescribed burning. None of the action alternatives includes the use of mechanical ground disturbing equipment, so the potential for moderate to severe surface soil disturbance is very low. Because the potential for soil disturbance is low, the effects of the action alternatives on rare plants are low as well.

All known and potential Pacific Southwest Region Sensitive plant species in the project area are adapted to light soil disturbance and natural fire. Wildfire is a natural landscape process, with which these plant species have evolved. Additionally, all prescribed burning would occur in the spring and fall, under very cool burn prescriptions. Therefore, there would be no significant positive or negative direct effects on known sensitive plant species under the action alternatives. Very small numbers of Forest Service (FS) sensitive plants may be negatively affected by the action alternatives, but it would not have any significant negative direct effects on sensitive plant species.

Indirect Effects

Under Alternative 1, indirect negative effects on undiscovered individuals and potential habitat for FS sensitive plants may occur. Without treatment, trees and dead fuel loading would be left in place. This could mean fires in the future may be more intense and widespread, than without treatment. Over time, the No Action Alternative would create heavy fuel-loading (downed trees) that would cause a longer residence time and more intense soil heating from future fires. This could cause light to moderate soil disturbance and erosion which could be detrimental to habitat for the perennial, non-rock outcrop, mid-seral species: Shirley Meadow star-tulip and Tulare cryptantha. Unexpected larkspur and Kaweah fawn lily are late-seral rock outcrop species and would not be subject to indirect effects under Alternative 1 because of their habit of growing where fuel loading is naturally low.

Given the nature of the action alternatives (e.g. hand crews and prescribed burning), they would result in minimal indirect effects on known populations and potential habitat of sensitive plant species. Unexpected larkspur and Kaweah fawn lily have an even lower potential to be indirectly effected because of their rock outcrop habitat.

In the action alternatives, short-term increases in risks from the introduction and spread of noxious weeds from crews and vehicles used during implementation of the project, as well as reductions of soil cover, can be expected. Reductions of soil cover increases the risk of introduction that weeds can become established. Noxious weed infestations are a threat to sensitive plants and their habitats. Mitigations to prevent the introduction and spread of noxious weeds into the proposed treatment areas have been built into the project. These practices would greatly reduce the risk of negative indirect effects from noxious weeds on sensitive plants under the action alternatives.

Cumulative Effects

The area of analysis for cumulative effects is greater than for the project area, and consists of the entire range of each sensitive plant species with potential to be found within the project area. The current conditions (population trends) of these sensitive species are either unknown or presumed stable. Many sensitive plant habitats on the Forest have a long history of disturbance and undisturbed reference habitat is often lacking. Comprehensive ecological information does not exist for most sensitive plants on the Giant Sequoia National Monument, but aspects of plant ecology can be deduced from substrate and plant community preference. This includes the species with potential to occur in the Tule River Reservation Protection Project area. Most, if not all, populations and habitat of these species occur on federal land.

Management activities that have impacted sensitive plant occurrences within the analysis area for each species include: grazing, fire suppression, siviculture planting/release, mining, development, and recreational use. These cumulative impacts have altered the present landscape to various degrees. However on federal lands (where the total or majority of populations of these species exist), all current and future management activities with the potential to effect these species include prescriptions to minimize or eliminate effects on sensitive plants. Minimizing changes to sensitive plants and their habitats (across the entire distribution of each species) is the most effective way of reducing cumulative impacts. If adverse effects have been minimized at the local level, cumulative effects would not occur.

Past and current activities on National Forest System lands have altered potential habitats for the following sensitive plant species: Shirley Meadow star-tulip, Tulare cryptantha, unexpected larkspur, and Kaweah fawn lily. Because of past, present, and future mitigations, the positive or negative cumulative effects, in both action alternatives are minimal. The No Action Alternative would have minimal adverse cumulative effects, as well.

Determination

The Forest Botanist determined that the Tule River Reservation Protection Project would have no positive or negative effect on threatened, endangered or candidate plant species.

The Forest Botanist determined that the Tule River Reservation Protection Project **may affect** a small number of individuals but is not likely to result in a trend toward federal listing or loss of viability for Shirley Meadow star-tulip, Tulare cryptantha, unexpected larkspur, and Kaweah fawn lily.

This information is drawn from the Botany BA/BE (Linton 2014), which is hereby incorporated by reference.

Effects on Cultural Resources

According to the *Tule River Reservation Protection Project Specialist Report: Cultural Resources and Tribal and Native American Interests* (Cultural Resources Report) (Gassaway 2014), effects on cultural resources are described in terminology consistent with the regulations of the Council on Environmental Quality and in compliance with the requirements of both the National Environmental Policy Act (NEPA) and Section 106 of the National Historic Preservation Act (NHPA). The determination of effect for the undertaking (implementation of the alternative) required by Section 106 of the NHPA is included in the summary of effects for each alternative. Section 106 of the NHPA requires a federal agency to consider the effects of its actions on properties included in, eligible for inclusion in, or potentially eligible for inclusion in the National Register of Historic Places (NRHP) and provide the Advisory Council on Historic Preservation a reasonable opportunity to comment.

Analysis Assumptions and Methodology

This impact analysis methodology applies to primary types of cultural resources found within the Area of Potential Effect (APE), archaeological sites.

The assumptions used in this effects analysis include:

- Cultural resources would be managed according to existing laws, regulations, and policy to protect these resources according to societal expectations.
- Active management, encompassing the greatest acreage, would provide the best opportunities for identifying, protecting, and interpreting cultural resources.
- Events outside of management activities, such as wildfires, have the greatest potential to negatively affect cultural resources; these unplanned activities do not lend themselves to identification, anticipation, or mitigation.
- Ground-disturbing management activities could have direct adverse effects on cultural resources.
- Reduction of fuel loads on and around a cultural resource has a long-term protective effect.
- High intensity fire can have a detrimental effect to all cultural resources, regardless of class.
- Emphasizing fire suppression without an aggressive prescribed fire program would increase risks to cultural resources from catastrophic wildfires.
- Prescribed fire programs pose less risk to cultural resources than fuels management based primarily on fire suppression.

As a rule, any activity that causes ground disturbance (disturbance to the soil matrix that contains the cultural resource) has the potential to adversely affect cultural resources, both directly and indirectly. This results in changes to the physical attributes of the resources that, in turn, compromise the integrity of the cultural resource and its context. Its context (the spatial relationship between the various artifacts, features and components of the cultural resource) is what is scientifically studied and interpreted and is the basis for the site significance determination. This effect is irreparable and considered adverse. Even a scientific archaeological excavation has an adverse effect because it is destroying the integrity and context of the cultural resource by removing its artifacts, features and components. In addition the significance of cultural resources is often dependent on their context in the larger landscape as much as on their immediate physical features. Combined effects of ground disturbing activities may jeopardize the quality of cultural resources. Ground disturbing activities may affect the "feeling" of a cultural site, even when the activities occur beyond site boundaries. Indirect effects on setting, association, or feeling may also detract from the value of a cultural site for public interpretation and education.

Impact analysis follows established procedures and stipulations outlined in regulations implementing Section 106 of the NHPA (36 CFR 800) and Regional PA. These include: (1) identifying areas and types of resources that could be impacted, (2) assessing information regarding historic properties within this area and conducting additional inventories and resource evaluations, as necessary, (3) comparing the location of the impact area with that of important cultural resources, (4) identifying the extent and types of effects, (5) assessing those effects according to procedures established in the Advisory Council on Historic Preservation's regulations, and (6) considering ways to avoid, reduce, or mitigate negative effects.

Impacts are considered either adverse or beneficial to historic properties (cultural resources) when analyzed under NEPA. However, impact type is not viewed this way when conducting analysis for the purposes of assessing effects on historic properties under the Section 106 of NHPA; effects are either adverse or not adverse. Overall, non-beneficial effects usually result in compromising the nature of the cultural resource and may affect its eligibility for inclusion in the NRHP.

Adverse impacts to archaeological resources can result from manual or mechanical fuels treatment, direct heating during fire, vegetation removal, ecological restoration and recreation construction. The intensity of impacts to archaeological resources can range from negligible to major, depending on the management actions taken and/or the intensity of burning or ground disturbance. The majority of these impacts are long-term in duration.

Fuel reduction and ecological restoration can also have beneficial impacts to archaeological resources. Burning duff and forest litter exposes mineral soil not visible during inventories of unburned areas, allowing for greater accuracy in documenting site constituents and boundaries. Burning within a natural fire regime also reduces the threat of high-intensity fire and the need for suppression activities. Restoration of unstable hydrological areas can stabilize and eliminate the loss of archaeological deposits.

There is also the potential for previously unknown cultural resources to be discovered through exposure and/or damage by land use activities that involve surface disturbance.

Unlike most other types of resource values, cultural resources are basically non-renewable resources. Damage or destruction to cultural resource sites is generally permanent. Effects on some cultural resources (such as the upgrading of windows in an historical building with non-compatible materials (wooden windows to aluminum) can be reversed; however, until that happens, the effect is ongoing and potentially adverse.

The main focus of the effects analysis for cultural resources is the intensity within the context of NRHP eligibility and integrity. The significance of cultural resources, particularly ethnographic, and cultural landscapes, often depends on their context in the larger landscape as much as their immediate physical features. Activities that occur beyond the physical boundaries of the cultural resource can affect the historic property if they affect the larger, landscape-level context.

The following factors were determined to be the best factors indicating potential effects on cultural resources:

- Total acres of potential ground disturbance.
- Ability to mitigate impacts through the Regional PA standard protection measures

Direct Effects on Cultural Resources

Effects of Vegetation Management on Cultural Resources

The vegetation management proposed in Alternatives 2 and 3 of the TRRP Project includes felling trees, dragging of logs and trees on certain types of cultural resources, or by erosion caused by vegetation removal or damage. Vegetation removal could also increase the visibility of cultural resource sites, which may result in increased vandalism. Maintenance of permanent or temporary roads could also affect cultural resources.

Effects of Fire and Fuels on Cultural Resources

Fire and fuels management in all the action alternatives focuses on creating defensible space and fuels reduction through shaded fuel breaks and understory burning.

Any fire can potentially affect cultural resources. The effects of fire on cultural resources are often divided into and described as direct fire, operational, and post-fire effects. Direct effects are those caused by the fire itself. These are caused by either direct contact with flames or being in close proximity to heat produced by combustion or smoke. Operational effects are the result of management operations like fire line construction or staging. Post-fire effects are most often those caused by the change in soil stability and vegetation following a fire.

The differences in effects on cultural resources from fire come with the differences in the intensity of a fire, the ability to identify cultural resources and initiate protective measures, the type of management actions taken to control the fire, and the post-fire effects.

The potential effect on cultural resources from direct fire depends on the material components of the cultural resource and the magnitude of the heating and combustion generated by a fire. Specifically, fire and its byproducts can alter such resources through total consumption, melting, breakage, spalling, charring, and discoloration. Different materials are vulnerable based on the peak and duration of the exposure to heat and combustion. For example, a wooden structure may easily ignite and be fully consumed, whereas a bedrock milling feature in the same fuel model is relatively impervious to fire. Further, some raw materials may have multiple importance attribute classes that are affected at different temperatures and/or durations. For example, in the case of obsidian artifacts, hydration rinds can be compromised at relatively low temperatures (<200–300°C), whereas severe morphological damage such as breakage or melting generally does not occur until higher temperatures (>700°C) are reached (Deal 2001).

Perishable artifacts (those that have carbon in their makeup) have virtually no tolerance for fire and would be destroyed by it. Non-perishable artifacts (depending on the artifact type) would tolerate only low- or moderate-intensity fire. Cultural landscapes can tolerate fire intensity that would not cause the introduction of non-compatible elements (such as bulldozed fire lines) or a change in vegetation community (chaparral to grasslands).

The magnitude and duration of the heat pulse depends on fuel loading, fuel moisture content, fuel distribution, rate of combustion, soil moisture content, and other factors. The movement of heat into the cultural material is not only dependent upon the peak temperature reached, but even more so upon the length of time that the heat source is present and the composition of the cultural resource. Because fuels are not evenly distributed on or around a cultural resource, and due to the variability of materials types that make up a cultural resource site, a mosaic of heating and corresponding effects usually occurs. The highest heat pulses are usually associated with areas of greatest fuel consumption and the areas that burn the longest.

Artifacts surrounded or in contact with fuels such as wood and duff are most susceptible to direct contact with flames and heat. These artifacts are affected by convection, radiation, and conduction heat transfer. Artifacts and features above the ground surface (i.e., structures, arboglyphs, rock art, etc.) are susceptible to preheating, convection heat transfer, and smoke impacts. Thus, surface and shallow cultural resources consisting of flammable organic components (i.e., wooden structures, botanical remains) are at greatest risk from direct flame impingement, especially high intensity fire.

High-intensity fire in general has a greater potential to negatively affect cultural resources than low-intensity fire. Fires with cool combustion temperatures, generated by sparse understories and light fuels, have a lower potential to affect diagnostic artifact characteristics. Fires designed for cool combustion temperatures, such as controlled burns, can avoid major impacts on archaeological sites and artifacts. Thus, prescribed burns can be effectively used to control vegetation on archaeological sites without damage to cultural resources (U.S. Army Corps of Engineers 1989a).

Operational effects are usually from ground-disturbing activities, but can also be from backfires and burnouts, and the use of fire retardants. They are not limited to wildfires, but can also occur during prescribed burns. These effects are not always in the immediate vicinity of a fire, but can occur miles away as a result of the construction of camps, fire lines, etc. Operational effects can be mitigated, if planned in advance, to avoid and protect cultural resources.

Wildfire ignitions are unplanned and thus limit the ability for prior cultural resources identification and the development and implementation of protective measures for cultural resources. These increase the potential for negative effects on cultural resources. Extreme fire behavior associated with uncontrollable wildfire has a higher potential to affect cultural resources. Suppression actions taken for uncontrolled wildfire typically have limited cultural resource management input and have a greater potential to negatively affect cultural resources than pre-planned projects. Managed wildfires, while often having lower fire intensity than uncontrolled wildfire, usually have limited cultural resource management input and also have more potential to negatively affect cultural resources than prescribed fire.

Activities associated with wildfire suppression that cause ground disturbance (such as fire lines, helicopter bases and heliports, base/spike camps, and drop points) can affect cultural resources. Foam or water applied to hot rock surfaces causes spalling, "potlidding," or fracturing that can damage archaeological features. Water and retardant drops can damage or destroy historical structures or hasten their deterioration.

Any type of vegetation removal, from either hand treatment or fire, reduces protective vegetative cover and increases the visibility of cultural resources, which can result in unlawful collecting and excavation. The lack of vegetation can also contribute to an increase in erosion that can damage or destroy the site matrix. Fire on any level can result in the loss of ethnographic resources and the disturbance and degradation of traditional plant gathering areas, cultural sites, and sacred or spiritual places.

Fuelbreaks and other ground disturbances associated with fire protection often provide access into areas that were previously inaccessible, resulting in an increased potential for site damage and vandalism. Erosion runoff from these sites can affect cultural resource sites located within or adjacent to these features.

Low-intensity fire and planned vegetation reduction has a beneficial effect of protecting cultural resources from catastrophic, high-intensity fire and large-scale post-fire erosion.

Post-fire effects include increased erosion of soils that can remove or bury archaeological resources, increased tree mortality resulting in impacts from trees falling or uprooting, increased rodent and insect populations that can alter subsurface soil structure, intentional and inadvertent looting, increased microbial activity which can lead to increased feeding on organic matter within archaeological soils, and the addition of “new” carbon, which can be move through the soil column of archaeological sites by a variety of agents. These potential effects can be mitigated during prescribed burns through the use of fire prescriptions that limit the intensity of the fire.

In the case of fuels reduction, either by hand treatments or prescribed fire, the project planning process allows time to identify cultural resources and to develop and implement protective measures. This planning leads to greater protection of cultural resources and longer-term protection of cultural resources because of reduced fuel loads. The potential for operational effects is greatly reduced because control lines and staging can be placed to avoid cultural resources. The potential for direct fire and post-fire effects are also reduced because site-specific projects are planned to avoid extreme fire intensity, which has the greatest potential to negatively affect cultural resources.

Wildfire

The present vegetation condition, including high surface fuel loads, overstocked stands, and longer fire seasons, has increased the potential for intense wildfires.

As described in Chapter 2, mitigation measures for cultural resource site protection include a program of pre-fire surveys of high-susceptibility areas, potential fire control lines, and other fire suppression-related activity locations. Where cultural resources are found, programmatic agreement standard protection measures would be used, such as project redesign, relocation, protective buffer areas, and monitoring to protect affected cultural resources. Inventories should also occur during fire suppression activities in areas not inventoried. Effective treatment measures should be used to rehabilitate fire suppression-related ground disturbance.

Direct and Indirect Effects

Under Alternative 1, the lack of active management and fuels reduction decreases the potential for surface impacts to cultural resources from management actions. The continued accumulation of surface and ladder fuel in Alternative 1 has a higher potential for unplanned wildfire impacting cultural resources than either of the action alternatives.

Alternative 2 identifies 1,410 acres of shaded fuel beaks and understory burn. The decrease in surface and ladder fuel in Alternative 2 would have greater beneficial effects on cultural resources than Alternative 1 because the reduced surface and ladder fuels would lead to decreased heat pulse and fire effects on cultural resources at 70 percent of the sites within the project.

While creation of fuel breaks and preparation for understory burns increases activity in and around cultural resources, which increases the potential for effects on cultural resource sites, these managed actions enable cultural resources to be identified and monitored (Table 39). Fuels reduction on and near cultural resource sites would protect the sites from high-intensity fire.

Table 39: Archaeological Sites by Alternative

Forest Service Site Number	Type	Alternative 2	Alternative 3
05135200067	PRE	Understory Burn	Other Fuel Treatments
05135200068	PRE	Planted Stand	Planted Stand
05135200138	PRE	Understory Burn	Understory Burn
05135200139	HIS	No Treatment	Other Fuel Treatments
05135200191	MUL	Understory Burn	Understory Burn
05135200199	MUL	Planted Stand	Planted Stand
05135200300	HIS	No Treatment	Other Fuel Treatments
05135200341	PRE	Shaded Fuel Breaks	Shaded Fuel Breaks
05135200342	PRE	Planted Stand	Planted Stand
CA-TUL-3890		No Treatment	Other Fuel Treatments

The potential effects from fire breaks and understory burning on cultural resources under Alternative 2 would be greater than under Alternative 1. Due to fewer acres being treated in Alternative 2 fewer sites are potentially affected by fuels treatments than Alternative 3. Since fewer acres are treated in Alternative 2 more sites are still at risk from high intensity unplanned wildfires than Alternative 3, but less than Alternative 1.

The addition of 1,500 acres of fuels treatments in Alternative 3 would also increase the number of cultural resource sites that would be protected from high-intensity fire. While Alternative 2 protects 70 percent of cultural resources within the project area, Alternative 3 protects 100 percent of the sites (Table 40).

Potential negative effects from ground disturbance during fuels treatment would be greater than under Alternatives 1 and 2. But the protection from high intensity unplanned fire is greatest in Alternative 3.

Cumulative Effects for Cultural Resources

There are no reasonably foreseeable projects that would be occurring in this project area that would also affect the cultural resources analyzed in this document. Cultural Resources outside this project are analyzed on a project-by-project basis and for sites on Sequoia National Forest the vast majority of projects use standard mitigations which greatly reduce or eliminate effects on those resources. The greatest cumulative effect to cultural resources comes from projects not on federal lands. Because of the rapid rate of urbanization, the loss of cultural resources, often unmitigated, is putting greater significance on the cultural resources on Sequoia National Forest. The cultural resources on National Forest System lands are afforded a higher level of protection than those on private lands, thus the public looks to the national forest cultural resources as a more valued resource. At the same time, given the changing cultural demographics, some national forest users may not see the relevance of cultural resource protection to their cultural norms and values, which impedes the effort to protect cultural resource sites.

Through implementation of the mitigation measures described in Chapter 2, which are consistent with the Regional PA, the differences in cumulative effects on cultural resources by authorized activities under the different alternatives is low. The difference between alternatives and their potential effects on cultural resources comes from the potential difference in fire effects from an unplanned wildfire. Large scale, crown fire potential in Alternative 1 could adversely affect cultural resources while the large decrease in potential for crown fire in Alternative 3 would greatly decrease the potential heat pulse to archaeological soils, destruction to burnable artifacts and features, and the decrease in potential erosion and run off post burn that could move archaeological deposits and damage sites. See Table 39 for the potential effects on cultural resources by alternative.

Table 40: Potential Effects by Alternative

Potential effect from	Alternative 1	Alternative 2	Alternative 3
Management actions	None	Minor	Slightly more than Alt. 2
Unplanned wildfire	High	Low to Moderate	Low

This information is drawn from the Cultural Resources Report (Gassaway 2014), which is hereby incorporated by reference.

Effects on Tribal Relations

Tribal and Native American Interests - Assumptions

The following assumption applies to the assessment of the environmental consequences of the alternatives:

- Activities that reduce the potential for large scale fire to enter the Reservation have the greatest potential to benefit the tribe.

Direct Effects on Tribal and Native American Interests

Effects of Vegetation Management on Tribal and Native American Interests

Healthy and diverse vegetation potentially provides a wide range of plants that Native Americans use for a variety of cultural reasons. Invasive species pose a threat to a healthy vegetation community. Certain management activities pose environmental consequences that may be considered negative by the Native American community.

The Native American community acknowledges and urges the Sequoia National Forest to protect giant sequoias by closely linking vegetation management and fuels management. They further urge the forest to reduce the excessive numbers of shade-tolerant species in the groves to provide favorable conditions for giant sequoia establishment, protect the groves, and allow adequate openings for giant sequoia establishment, and growth.

The Tule River Tribe has expressed concerns that vegetation management on the forest should: address the potential spread of forest insect and disease activity to tribal forestlands, fuels within sequoia groves, and be proactive and based on scientific research and proven management practices.

Effects of Fire and Fuels on Tribal and Native American Interests

Due to the present situation with vegetation (high concentrations of fuels due to fire suppression over the last 100 years), an increase in acres burned due to wildland fires can be expected. Fire and fuels management is of great interest to tribes and Native Americans, especially to the Tule River Tribe whose reservation is partially surrounded by the Monument.

Wildland fire can disturb and degrade traditional plant gathering areas, archaeological sites, and sacred/spiritual places, as well as cause the loss of ethnographic resources. If not properly managed, prescribed fire can have the same results. However, with proper management, prescribed fire can be used to help promote the propagation of selected species of plants (basketry plants) important to Native Americans.

Fire of any nature may alter landscapes important to traditional cultural beliefs or practices. An indirect effect of wildland fire is an increase in access created by the removal of vegetation. This access could bring an increase in use to areas essential to Native Americans as places for solitude or privacy, which can be beneficial or detrimental to tribal interests.

Wildland fire suppression and fire protection programs (community defense zones) have the potential to introduce foreign visuals (firelines, etc.) into a traditional landscape that may be integral to traditional or contemporary ceremonies and practices.

Prescribed burning may directly damage or destroy cultural resources and other values held to be of significance by contemporary cultures, and it may alter landscapes important to traditional cultural beliefs or practices.

Mitigation measures suggested by the Native American community include focusing on land management activities to hinder the spread and establishment of invasive species (See Chapter 2). Specifically, they recommend focusing eradication on the correction of the chronic human-related land disturbance activity responsible for the conditions that facilitate the establishment of invasive species, and it should restore the native vegetation and natural disturbance regime (including fire). They also recommend the use of hand weeding or hand removal to reduce concerns about the use of herbicides.

Under all the alternatives, the current lack of information is the limiting factor in the assessment of environmental consequences of activities on those items of concern to local tribes, Native American groups, and individuals. The desired information centers on the type of resources used (plants, stone, etc.), resource locations, and the relationship of the natural environment to native people. Fundamental baseline inventory data are limited and usually available on a project-specific basis rather than a landscape level. This is further accentuated by the hesitancy of the Native American population to share information with the national forests out of concern that the information would not remain confidential and the resources of concern would be damaged or destroyed.

Native Americans view their space within the Monument as a participant, not as a manipulator or manager. Any alteration, such as ground disturbance, that is permanent and not in harmony with the environment could be a negative effect in the Native American view.

They are also concerned with impacts on cultural resources that are associated with their ancestors and other indigenous people who lived in the Monument area. The discussion of environmental effects in the Cultural Resources section of this EIS that is applicable to Native American cultural resources applies here and is not repeated. Growing emphasis on Native American input to the management of national forests has the possibility of broadening the understanding and awareness of historical ecosystem management.

Any management direction that could result in alteration of or the introduction of non-natural elements into the natural environment could be an issue of concern to tribes, Native American groups and individuals. Any direction that could promote, improve, preserve, or restore the natural environment and natural features, or promote the fabric of harmonious environment interactions, would probably not be viewed as an issue of concern. Any management direction that promotes the ability to access the natural open space of the national forests would be more acceptable to tribes, Native American groups and individuals than direction that restricts access.

All alternatives would continue tribal relations protocols established by laws and regulation, and policy. Government-to-government consultation and consultation with non-federally recognized tribal groups and individual Native Americans would continue to follow existing laws and regulations.

Summary of Environmental Consequences by Alternative on Tribal and Native American Interests

Under Alternative 1, the lack of active management and fuels reduction would allow fuel loads to increase overtime and leave the Reservation vulnerable to unplanned wildfires that move from the forest to the reservation. Alternative 1 has a higher potential for unplanned wildfire impacting Tribal and Native American Interests than either Alternative 2 or 3.

Alternative 2 identifies 1,010 acres of shaded fuel beaks and understory burn. The decrease in surface and ladder fuel in Alternative 2 would have greater beneficial effects on Tribal and Native American Interests than Alternative 1 because it reduces the potential for unplanned wildfires to move from the forest to the reservation

The potential beneficial effects from fire breaks and understory burning on Tribal and Native American Interests under Alternative 2 would be greater than under Alternative 1. Since fewer acres are treated in Alternative 2, Tribal and Native American Interests are at a greater risk from high intensity unplanned wildfires than in Alternative 3.

The addition of 1,500 acres of fuels treatments in Alternative 3 would have the greatest reduction in fire intensity and potential for crown fire. Alternative 3 would greatly increase the potential of containing a fire on NFS lands before it crossed onto the Reservation thus having the greatest potential beneficial effects on Tribal and Native American interests.

Cumulative Effects for Tribal and Native American Interests

The TRRP project is the first project proposed and analyzed in the Tribal Fuels Emphasis Treatment Area (TFETA). As designated in the Monument Plan, the TFETA covers 56,640 acres. The TRRP Project encompasses up to 5 percent of the TFETA. It is likely that additional fuels reduction projects would be proposed within the TFETA, though no additional projects have been identified to date. In addition the Tule River Tribe has identified their lands immediately adjacent to the forest for fuels reduction, and has begun to implement those fuels reduction projects.

Alternative 1 would not move forward with the management strategy of reducing fuels and decreasing the potential for unplanned wildfire spread into the Reservation. Over time the increasing fuel loads and potential fire intensity would reduce the effectiveness of fuels reduction projects completed by the Tule Tribe on their land. A decision to not reduce fuels in this portion of the TFETA, and as a project under the TFPA, could delay the potential for future fuel reduction projects within the TFETA. Delays in additional fuels reduction in the TFETA could have cumulative negative effects on Tribal and Native American Interests. Thus Alternative 1 would have a largest potential negative cumulative effect.

Alternative 2 would begin management strategies to reduce fuels and decrease the potential for unplanned wildfire spread into the Reservation. The decreased fuel loads and potential fire intensity would increase the effectiveness of fuels reduction projects completed and planned on the Reservation. The implementation of fuels reduction in this part of the TFETA may increase the ability to implement fuel reduction projects in other portions of the TFETA and give the Tule Tribe incentive to propose additional projects under the TFPA. Thus, Alternative 2 would have a potential beneficial cumulative effect to Tribal and Native American Interests. Alternative 2 only treats 2.5 percent of the TFETA.

Alternative 3 treats approximately twice the acreage of Alternative 2, or five percent of the TFETA, so its overall effect is greater than Alternative 2. Thus Alternative 3 would have the greatest potential beneficial cumulative effects on Tribal and Native American Interests.

This information is drawn from the Cultural Resources Report (Gassaway 2014), which is hereby incorporated by reference.

Effects on Fire and Fuels

Models and Methodology

According to the *Tule River Reservation Protection Project Fire, Fuels, and Air Quality Report* (Fire and Air Quality Report) (Ernst 2014), the FlamMap 3.0 fire simulator modeling program (Finney et al. 2004-2006) was used to model the potential fire behavior for the project area. The program calculates fire behavior and environmental variables across a landscape using Geographic Information System (GIS) spatial computer modeling layers, fire behavior fuel models, weather and fuel moistures. Modeling a potential fire across the landscape and project area was completed in the fall of 2009. FlamMap analysis of simulated wildfires in the project area gave measurable results in multiple categories for the two action alternatives when compared to the no action alternative. These categories are flame length, rate of spread, and fire behavior (surface fire, passive crown fire, and active crown fire). Further analysis was conducted using FlamMap on fire flow paths and fire arrival times for each alternative.

Fire intensity refers to the rate of heat produced by the flaming front of a wildland fire at a point in time, and is expressed in British Thermal Units per foot per second (BTU/ft/sec). Fire intensity is influenced by the amount of fuel available for burning, local weather conditions and topography. While there are several ways of expressing fire intensity, fireline intensity is the most widely used. A visual indicator of fire intensity is the flame length (DeBano et al. 1998). Table 41 relates fireline intensity, flame length, and fire suppression difficulty.

Table 41: Fire Line Intensity Interpretation

Intensity	Flame Length	BTU/feet/second	Interpretations
Low	Less than 4 feet	Less than 100	Direct attack at head and flanks with hand crews, handlines should stop spread of fire
Low-Moderate	4-8 feet	100-500	Employment of engines, dozers, and aircraft needed for direct attack, too intense for persons with hand tools
Moderate	8-11 feet	500-1000	Control problems, torching, crowning, spotting; control efforts at the head are likely to be ineffective
High	Greater than 11 feet	Greater than 1000	Control problems, torching, crowning, spotting; control efforts at the head are ineffective

*Fireline intensity interpretations from DeBano et al. (1998)

The Forest Vegetation Simulator (FVS; Dixon 2010) computer program and the Fire and Fuels Extension (FFE; Rebain 2010) to FVS were utilized for this analysis. FFE simulates fuel dynamics and potential fire behavior over time in the context of stand development and management. Outputs derived from this program were used to predict effectiveness of treatments over time.

For each alternative the tree stands were simulated to be treated the first year and then grown for 10 and 20 years post treatment. Modeling outputs provided stand characteristics that were summarized and compared by alternative.

GIS spatial layers were obtained from Landfire (2009) and Sequoia National Forest GIS databases including, fuel models, elevation, aspect, slope, canopy cover, canopy bulk density, canopy base height, infrastructure and vegetation.

Fuel Models

The Standard 40 Fire Behavior Fuel Models (Scott and Burgan 2005) were used for modeling the project area and adjacent lands north to the Tule River Canyon (Table 42). The fire behavior fuel models for existing conditions were downloaded from LANDFIRE (http://www.landfire.gov/2007) to represent Giant Sequoia National Monument and Reservation lands. The Solo 2 Fire of 2008 occurred after LANDFIRE data was collected. Fire behavior fuel models within the 2008 Solo 2 Fire perimeter required adjustment, and observations indicate that the expected fire behavior in 2009 (post fire) inside the perimeter was best represented by fuel model 181.

Fuel Model 181 was also used for modeling Years 1 through 5 post-treatment fuel conditions for for both action alternatives for this analysis as well (Table 8, Scott and Burgan 2005). After about 5 years of growth, the fuel models are assumed to change to higher loading amounts or fuel models.

Table 42: FLamMap Fire Behavior Fuel Models Pre- and Post-treatment

Pre-Treatment Fuel Models*	Percent of project area	Years 1 through 5 Post-Treatment Fuel Models
90s – Nonburnable	< 1	No Change
102 – low load grass	< 1	No Change
122 – moderate load grass-shrub	1	No Change
141 – low load shrub	< 1	No Change
142 – moderate load shrub	< 1	141
147 – very high load shrub	< 1	141
161 – low load timber-grass-shrub	< 1	181
165 – very high load timber-shrub	71	181
181 – low load conifer litter	9	No Change
185 – high load conifer litter	< 1	181
186 – moderate load broadleaf litter	17	181
187 – large downed logs	< 1	181
188 – long-needle litter	< 1	181

*Fuel Model codes: describe fuels that dictate fire spread, sometimes not the dominant vegetation.

Direct and Indirect Effects

Direct effects of the alternatives are summarized in Table 43 based on comparing the following characteristics: fire intensity (flame heights), rate of spread, surface and crown fire behavior, firefighter access, crew production rates, and reduction of fire threat.

Table 43: Direct Effects on Fire and Fuels Characteristics by Alternative (Averaged Across TRRP Project Area)

Characteristic	Alt. 1	Alt.2	Alt. 3
Flame Lengths ranging from 0-4 ft	4 percent	36 percent	32 percent
Flame Lengths ranging from 4-8 ft.	9 percent	14 percent	67 percent
Flame Lengths > 8 ft.	87 percent	50 percent	< 1 percent
Rate of Spread: 0-10 chains/hour	42 percent	69 percent	96 percent
Rate of Spread: >10 chains/hour	57 percent	31 percent	4 percent
Rate of Spread: reduced by 50 percent in Planning Area	No treatment = no reduction	Reduced by less than 50 percent	Reduced by 50 percent and greatest reduction across planning area
Barren (No fire activity)	0.5 percent	0.5 percent	0.5 percent
Surface Fire Behavior	14 percent	55 percent	95 percent
Passive Crown Fire	68 percent	34 percent	4 percent
Active Crown Fire	17 percent	10 percent	1 percent
Firefighter Suppression Access	Access is poor for existing condition	Improved on 1,410 acres	Same as Alt. 2 and an additional 1,500 acres
Crew Production Rates: comparison to pretreatment rate (minimum goal is to double the rate)	No change in rate	More than double rate in shrubs and triple rate in understory	More than triple rate in shrubs and 6 times rate in understory
Fire threat: Acres of treatment between private land and the Reservation	None	Treats private and Reservation land perimeters with shaded fuel breaks	Same as Alt. 2 and treats an additional 1,500 acres

Indirect effects of the alternatives were grouped into three categories. As mentioned previously, a fire regime refers to the Fire Regime Condition Class (FRCC) (NIFTT 2010) rating system based on departure from historically estimated fire regimes across the landscape. Connectivity is a spatial estimate based on location of project area treatments for each alternative in relation to private land, Reservation land, and the Camp Nelson project. Indirect effects for air quality are compared as projected changes to future wildfire emissions. See Table 44 for comparisons of these indirect effects for each alternative.

Table 44: Indirect Effects on Fire and Fuel Characteristics by Alternative (Averaged Across TRRP Project Area)

Characteristic	Alt. 1	Alt.2	Alt. 3
Fire Regime Condition Class (FRCC) *	No change, FRCC of 3	Closer to historical, FRCC of 1 to 2	Closer to historical, FRCC of 1 to 2
Connectivity to other land owners or projects	No connectivity to private land, Camp Nelson, nor the Reservation	Some connectivity to Reservation, mostly fuel breaks (corridors) to private land and Camp Nelson Project	Same as Alt. 2 plus landscape scale connection to Camp Nelson project
Change to future wildfire emissions	No change or increase in emissions	Some decrease in emissions	Greatest decrease in emissions

* These comparisons are on the spatial level of the project, not the landscape level.

FVS

FVS FFE was used to simulate treatment effectiveness for the two action alternatives based on estimated pile burning, and understory burning using prescribed fire. Table 45 lists tree mortality and growth modeling based on effects from pile burning and prescribed fire.

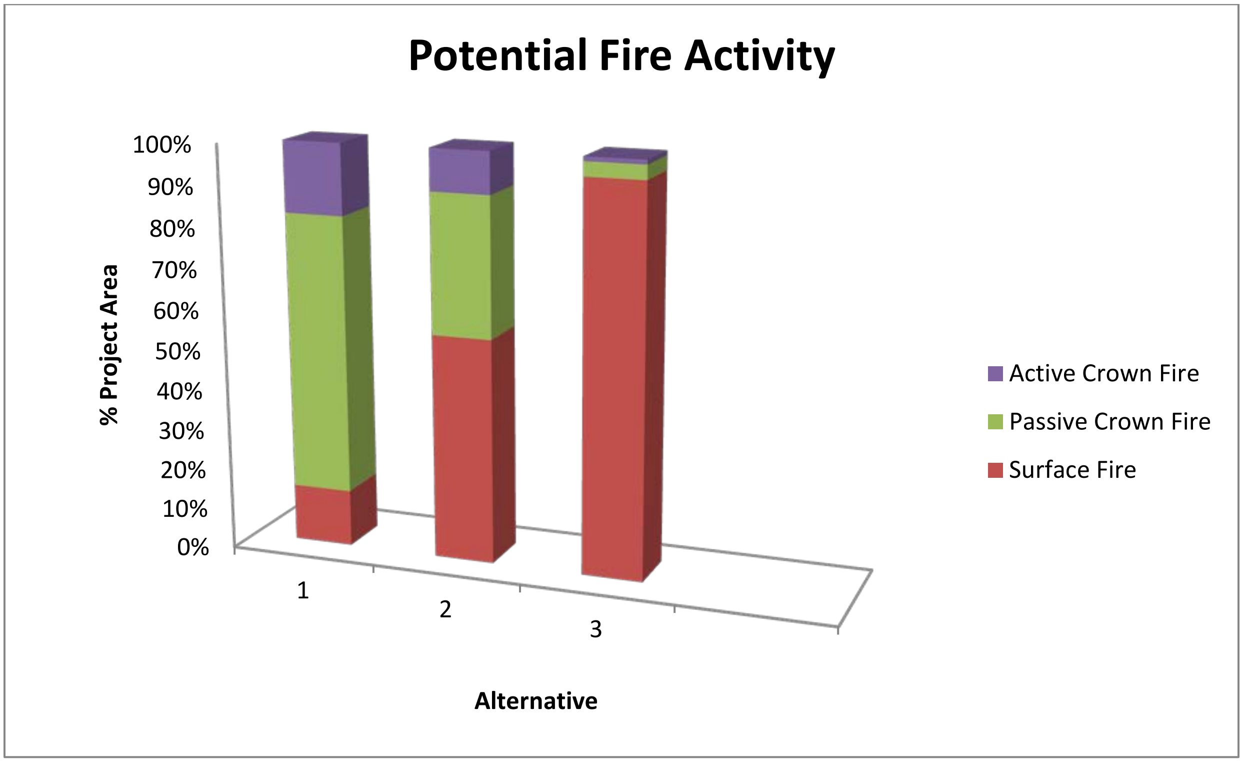
Table 45: Average Tree Mortality from Prescribed Burning by Size Class

Mortality (Trees per acre)	Alt 1	Alt 2	Alt 3
Trees < 15 inches dbh (75 percent of these are seedlings)	none	26	26
Trees 15-17.9 inches dbh	none	2	2
Trees 18-23.9 inches dbh	none	1	1
Trees 24-29.9 inches dbh	none	<1	<1
Trees 30-34.9 inches dbh	none	<1	<1
Trees $\geq$ 35 inches dbh	none	<1	<1

Fire Behavior Simulations

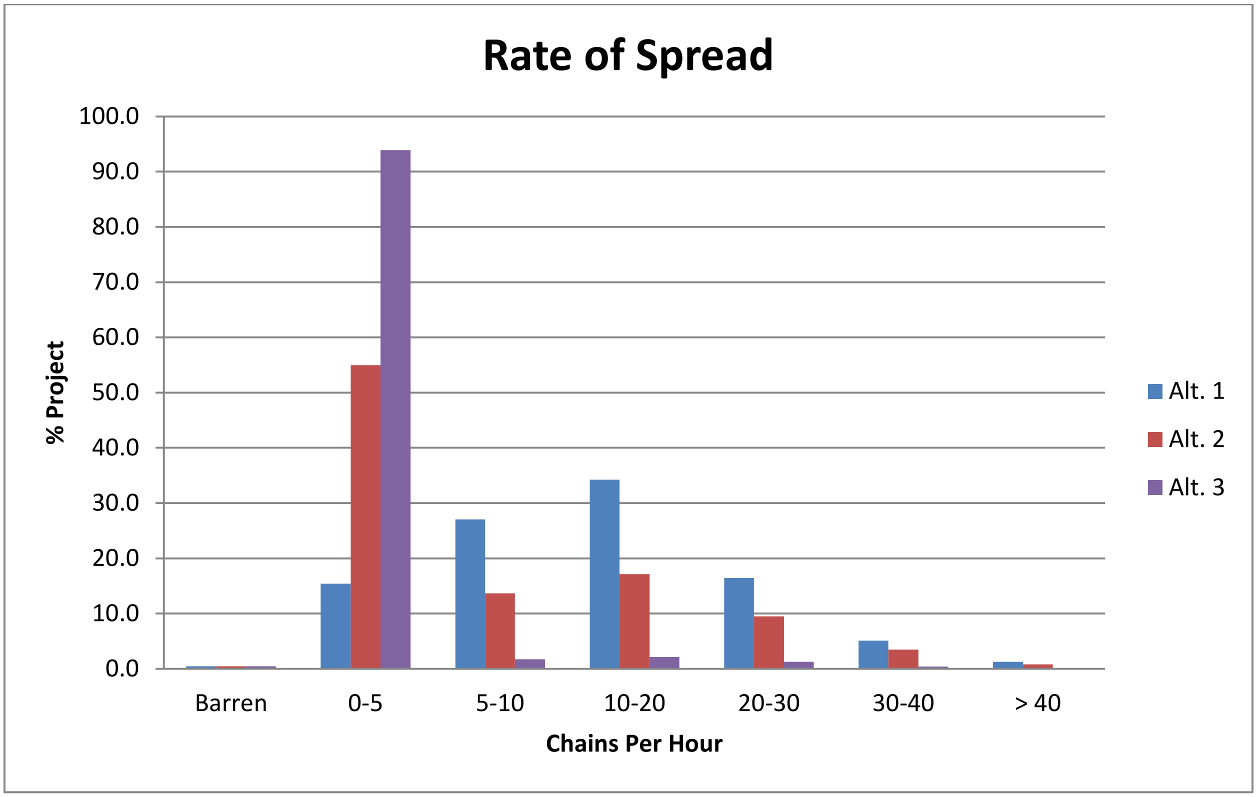
Figure 19 illustrates the differences in fire behavior categories for each alternative. No fire was simulated where barren fuel models were represented on the ground (less than 1 percent of project area). Alternatives 2 and 3 have different amounts of shaded fuel breaks, understory burning, and tree stand treatments. The modeled fire behavior post treatment decreased because fuel loading was reduced resulting in decreased vegetation to fuel future fires. Surface fuel loading reduction treatments included piling and burning, jackpot burning or understory burning. Alternative 3 has the best improvement in active and passive crown fire because of the greatest reduction in fuel loading based on the most acres proposed to be treated.

Figure 19: Fire Behavior Categories by Alternative



The modeled rate of spread was dramatically reduced by the action alternatives (Figure 20). See Table 43 for a comparison of estimated rate of spread amounts. Both Figure 20 and Table 43 are based estimates from 1 to 5 years post initial treatment time periods, thereafter the live fuels (vegetation) could grow or regenerate to higher levels than listed here. The most acres treated within the project area are proposed in Alternative 3; therefore, this alternative has the greatest reduction in rate of spread.

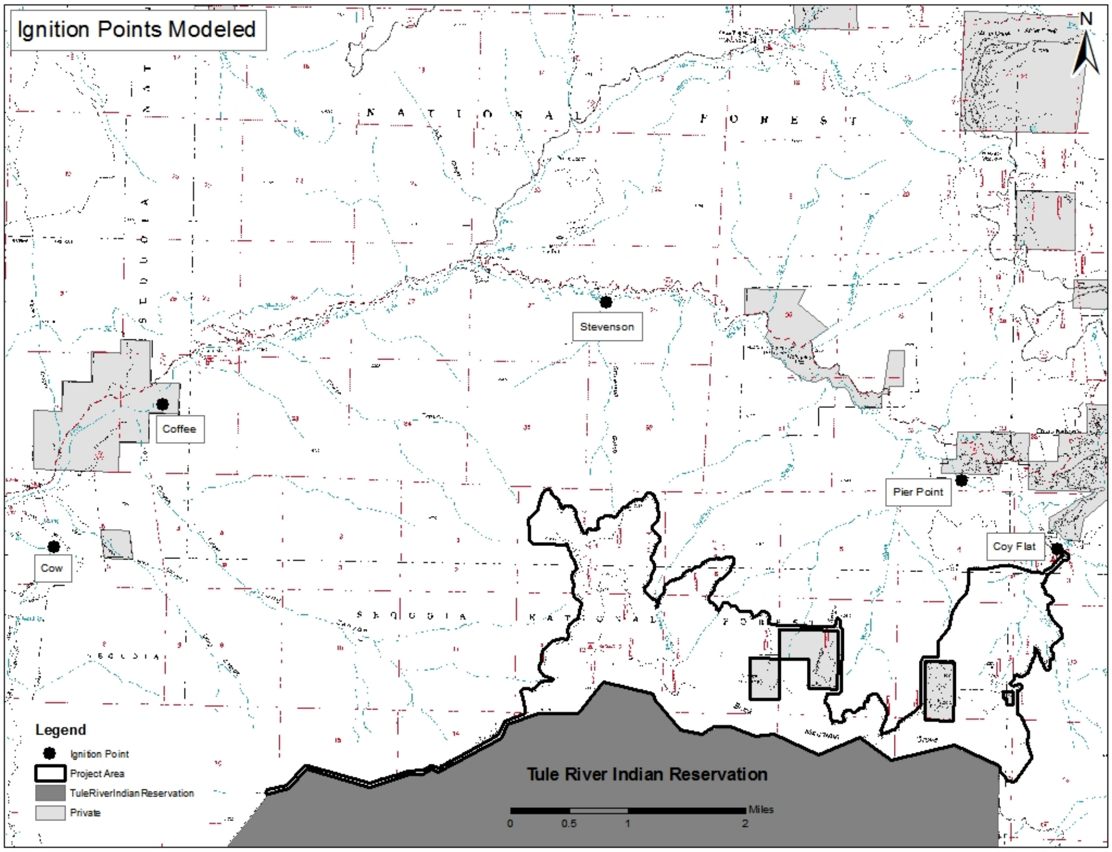
Figure 20: Rate of Spread Post Treatment for each Alternative



Fire Arrival Time/Burn Interval

FlamMap was used to model potential fire arrival time (fire growth) using five ignition points along the lower portion of the Middle Fork and SFMF Tule River drainages (Figure 21). Fire arrival time simulations were utilized as a measurement of simulated fire perimeter growth or fire progression. The change in fire size per burn period is a simulation of fire progression and is displayed in 6 hour intervals for a Stevenson ignition point for each alternative. The program simulated existing conditions and potential fire behavior after treatments for each alternative. The fire modeling, visually displayed in the burn interval maps, demonstrates that the action alternatives would slow a fire's rate of spread with Alternative 3 being the most effective.

Figure 21: Ignition Points Used for Fire Behavior Analysis (Travel time and Flow path)



Fire Flow Paths

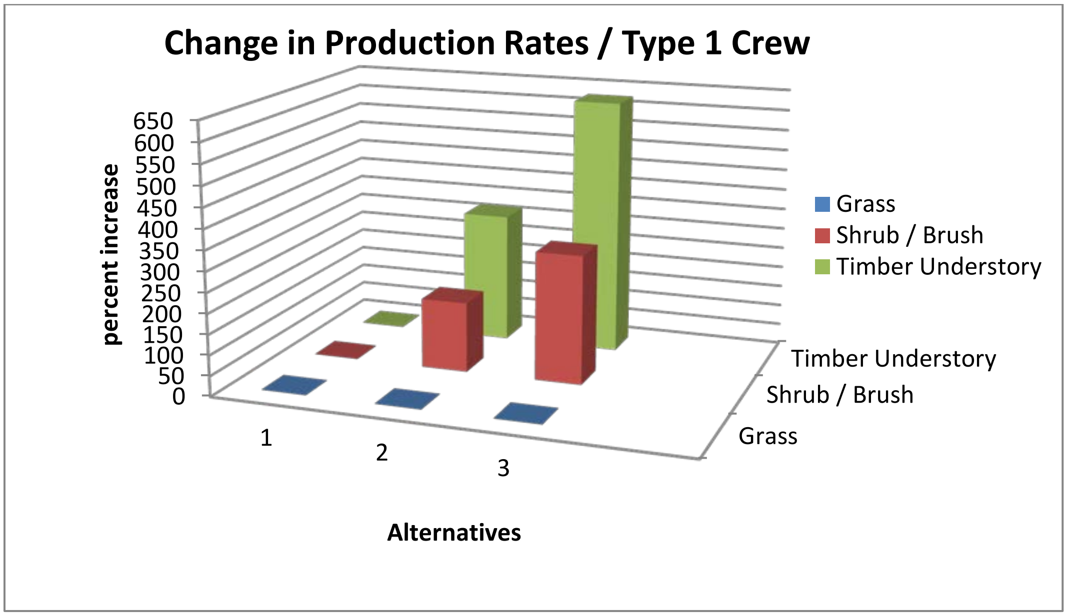
FlamMap was used to model potential fire flow paths using five ignition points along the lower portion of the Middle Fork and SFMF Tule River drainages. Overall, fire flow path analysis illustrated that fires tend to spread south from the ignition points toward the Reservation. Alignment with drainages enhances and funnels the fire spread. The FlamMap fire flow path modeling demonstrates that fire spread, headed south toward the Reservation, would be stopped, slowed, or change directions when fires reach the treatment areas because of the reduced fuel conditions. Some of the fire flow paths run through the project area because they are modeled without suppression activities. A fuel break or fuel reduction project by itself will not stop a wildfire. They provide a location that will increase the probability of success for fire suppression activities such as direct attack or firing out.

The results of the FlamMap modeling of the three alternatives demonstrate that the reduction of the unnatural hazardous fuels proposed in Alternatives 2 and 3 modify fire behavior and serve to protect assets at risk such as private land and the Reservation's valuable watershed.

Fire Line Production Rates

Both of the action alternatives reduce fuel loading, but differ in total acres of fuels reduction treatments. Line construction production rates are directly correlated to fuel loading changes. Reduced fuel loading creates the ability for Type 1 hand crews to construct fire control lines more rapidly. All fuel model changes in the grass category were estimated to have no change. As shown in Figure 22 annual growth of grass does not affect production rates.

Figure 22: Production Rates (100 Percent is Double the Production Rate for Existing Condition) a



[a] Grass is annual vegetation, which grows back each year, so no change is expected under any alternative.

Timber understory fuels acres would be treated in timber fuel types, including understory grass, shrub, leaves, and needle cast. For shrub and timber understory, the increase in fireline production rate is based on the amount of acres treated per alternative (Table 43).

After the proposed treatments, Alternatives 2 and 3 meet the minimum desired conditions to double fire line production rates compared to pretreatment levels. Alternative 3 would treat an additional 1,500 acres of shrub (primarily the shrub fields below Rogers Camp that ties into Camp Nelson Project) and timber understory fuels. Alternative 3 has the largest timber understory loading reduction (therefore highest increases in hand line production rates) compared to the other alternatives due to the proposed increase in acres treated in the timber understory fuel models. See Tables 41 and 43 for more comparisons.

Summary of Direct Effects

Existing conditions described previously would continue to exist under the No Action Alternative. Fire severity and intensity would continue to increase as fuel loading continues to naturally increase. If a fire were to occur as modeled, flame lengths would exceed 20 feet in height over 80 percent of the project area, rates of spread would continue to exceed production rates of crews, 85 percent of the project area would continue to support passive and active crown fire. Firefighter access in the event of the predicted fire would not be safe. Suppressing a fire before it spreads to the Reservation would be unlikely. Firefighter access would continue to decline with no treatment of fuels within the project area as fuels accumulate within travel corridors.

Fire regime condition class (FRCC) would continue to remain outside of historic fire return intervals. An increase in surface fuels would occur over time as existing snags, needle cast, and woody debris continue to accumulate. Snag densities are anticipated to increase with naturally and density-related tree mortality. Ladder fuels are also anticipated to increase as regeneration continues, and, in turn, decrease the average canopy base height within the project area.

Landscape level fuels reduction to protect Reservation lands from uncharacteristically severe wildfire would not be provided under Alternative 1. Alternative 1 creates no direct connections to recently planned or completed fuels reduction projects in the Monument. This alternative does not move the project area towards the desired conditions for the Monument or meet the Purpose and Need for this project.

Alternative 2 consists primarily of treatments along roadsides, ridge lines, private land boundaries, and planted stands of trees within the project area to create access for firefighting personnel to anchor during firefighting operations. Predicted flame lengths, fire line production rates, and crown fire activity within the treated portions of the project area would enhance firefighting effort. Flame lengths in approximately half of the project area, and type 1 crew production rates are met in timber and shrub fuel models. The crown fire potential, both active and passive, would be lowered from 85 percent of the project area down to 44 percent based on modeling 90th percentile weather. Firefighting capabilities would be enhanced by the treatments completed within the project area.

Effects associated with Alternative 2 would include the reduction of fuel loading and ladder fuels thus moving the project area toward desired fire regime condition class. Canopy base heights would increase as understory fuels and small trees are moved or burned. This would further reduce the chance of fire spread to the canopy of trees. Work along travel corridors would enhance firefighter access during fire situations. Reducing snags, which pose an eminent hazard for firefighter safety along these corridors, would also occur. Limited connectivity to private land and the Reservation would occur, mostly as shaded fuel breaks and not landscape scale treatments.

Alternative 3 includes all of the treatments in Alternative 2 and an additional area of surface fuels treatment designed to reduce fuels and the risk of fire below Rogers Camp. This alternative meets management direction for reduced flame length, reduced rates of spread, and increased Type 1 crew production rate in both shrub and timber fuel models. Fire modeling has shown that greater than 95 percent of the project area would remain a surface fire after treatment.

All effects associated with Alternative 2 would occur with Alternative 3. The number of acres moved toward desired fire regime condition class would increase to approximately 2,830. An additional indirect effect is the increased connectivity to the Camp Nelson Fuel Reduction Project. Snags greater than 15 inches would be felled if they pose an imminent threat to personnel implementing treatments. Alternative 3 would have the greatest potential to reduce fire threat because it treats the most acres between NFS land, private land, and the Reservation, and the landscape scale treatments make the largest improvement in public and firefighter access and safety. Both action alternatives provide a location that will increase the probability of success for fire suppression activities such as direct attack or firing out with Alternative 3 being more extensive.

Cumulative Effects

The cumulative effects analysis area for the fire and fuels analysis is south of the Tule River Canyon and north of the Reservation boundary. The eastern boundary is Slate Mountain and the western boundary is the forest boundary. The last 20 years and upcoming 20 years is the primary focus for actions and events because the growth of vegetation typically negates fuels reduction within 20 years. Fuels reduction can be by wildfire, prescribed fire, mechanical treatment or other means. It is assumed that private property owners would continue to complete minimum requirements to meet state laws for defensible space. However, this is not sufficient for reducing fire behavior to a level that protects the Reservation, improves firefighter safety, or moves the area towards the desired fire regime condition class. The list of reasonably foreseeable fire, fuels, and vegetation management projects or wildfire events that are considered to cumulatively affect the current project can be found at the beginning of Chapter 4.

Most past actions related to fire and fuels within this analysis area occurred long ago and are considered ineffective, with two exceptions: the 2008 Solo 2 wildfire and the recently completed Camp Nelson Project (see figures 4 and 5). The Camp Nelson Project reduced surface and ladder fuels by thinning trees up to 10 inches dbh, and moved that area toward desired conditions. Over time, the vegetation within the Camp Nelson Project will continue to grow and will gradually become an ineffective fuels treatment. Outside of the Camp Nelson Project, the vegetation is overgrown, and predicted flame lengths would exceed those desired.

The Tule River Reservation has been working on a similar project on Tribal lands immediately south of this project. The original request for the TRRP project submitted by the Tribe under the authority of the Tribal Forest Protection Act of 2004 recognized that it could be complementary to their project. The Reservation has been doing fuel treatments south of this project along the NFS and reservation boundary for the past several years. Their work combined with fuel treatments on the NFS side of the boundary would create an effective zone for stopping a wildfire originating from either side of the boundary.

After modeling different stand structures of Sierran mixed-conifer forest grown over 100 years, including those produced by fuel treatments, it was found that a low density forest dominated by large pines are the most resilient to wildfire, sequestered the most carbon, and had the lowest carbon dioxide emissions (North et al 2009). An analysis of different fuel treatments found understory thinning combined with prescribed burning will have the greatest reduction in potential wildfire severity without severely reducing carbon stocks (North et al 2009).

Under Alternative 1 current fuel loading conditions would continue to degrade. The shade tolerant tree species would continue to multiply. These trees provide the ladder to move fire into the crowns of the larger trees. Planted tree stands within the project area are overgrown with brush, tightly spaced trees, and limbs growing near the forest floor. The high level of surface fuels would continue to increase without actions to reduce these conditions. Under these conditions, current and future wildfires are expected to exceed capabilities of ground fire fighters to control the spread of the fire.

Without fuel reduction treatments, a wildfire burning in the existing conditions would be a high risk management incident. High risk fire management activities make it difficult to achieve multiple resource benefits for the ecosystem and the landowners. The safety risk for fire fighters and the public is high due to current heavy fuel loadings. The risk level would continue to grow in the future as fuel loading continues to increase with no treatment. Alternative 1 does not complement private landowner and tribal fuels reduction treatments as do Alternatives 2 and 3. No improvement in defending tribal lands is achieved by Alternative 1.

With no treatment, the ability to manage wildfires and prescribed fires to achieve fuels management and other resource objectives would be nearly impossible due to current fuel loading and forest stand characteristics that result in the potential for extreme fire behavior.

Alternatives 2 and 3 provide some connectivity to the Camp Nelson Project to the north and east, due to fuel breaks and travel corridor treatments that would enhance capabilities and safety of firefighting forces. The connectivity of this project with the Camp Nelson Project and Solo 2 wildfire area would provide strategic locations for wildfire suppression and prescribed burning operations in the future. This connectivity would also provide a strategic break in the continuity of fuels across the landscape, slowing the rate of spread and reducing flame lengths of wildfires moving up the Tule River Canyon and upslope toward the Reservation (Finney 2002). Thus the impact of the project reaches beyond the actual ground treated to limit fire spread throughout the lower Tule River Canyon.

Treatments proposed in Alternatives 2 and 3 would complement the adjacent fuel reduction work of home owners and the Reservation by increasing the safety ratio linking adjacent property and Forest Service activities spatially. Alternative 3 treatments include an additional 1,500-acre block of land that consists of surface fuel treatments between the shaded fuel break corridors on the south side of Camp Nelson. Networks of fuel reduction activities on the landscape create a vegetation framework that can support fire management activities that achieve multiple resource benefits.

The likelihood of future prescribed fire or wildfires being managed to benefit multiple resources would increase with implementation of either of the action alternatives, in proportion to the number of acres treated, because of the resulting reduction in fuel loading and changes to vegetation structure. Alternative 3 would result in the longest overall time period where stand conditions would permit use of prescribed or managed fire in the future.

Alternatives 2 and 3 incrementally move the project area toward a desired FRCC, toward condition class 1, with Alternative 3 moving the most acres towards this goal. This information is drawn from the Fire and Air Quality Report (Ernst 2014), which is hereby incorporated by reference.

Effects on Vegetation

Direct and Indirect Effects

According to the *Tule River Reservation Protection Project Fire, Silviculturist Specialist Report* (Silviculturist Report) (Powell 2014) the Forest Vegetation Simulator (FVS) was used to model the effects of no action, the proposed action, and Alternative 3. The Silviculturist based the modeling on the California wildlife habitat relationship (CWHR) cover types (Mayer and Laudenslayer 1988).

The direct effects of Alternative 1, no action, would be a continued accumulation of surface and ladder fuel in the form of intermediate and suppressed trees, standing snags, and fallen trees and limbs. Without treatment, FVS modeling of the areas with old growth habitat characteristics suggests that stands would exhibit a slight increase in both canopy cover and live tree basal area by the end of the first decade (2020) on approximately 2,149 acres. As shown in Table 46, weighted average canopy cover in 2010 was estimated at 62 percent, increasing to an estimated 65 percent by 2020.

Table 46: FVS Canopy Cover Percentage by Alternative

Alternative 1 (No Action)			Alternative 2		Alternative 3	
Time Frame	No treatment or Wildfire	No treatment with Wildfire	Treatment* with No Wildfire	Treatment with Wildfire	Treatment with No Wildfire	Treatment with Wildfire
2010	62	62	62	62	62	62
2020	65	21	61	34	60	51

*Treatment for action alternatives includes: (thin, pile burn, jackpot pile burn, understory burn, and felling of imminent hazards) in the areas currently considered suitable old forest habitat types (approximately 2,149 acres total).

However, under Alternative 1 the increasing canopy cover, especially in the form of co-dominant, intermediate, and suppressed trees, may have an indirect effect of increasing the amount and susceptibility of larger-sized trees being damaged or killed in a wildfire. As shown in Table 47, a wildfire could greatly reduce the canopy cover across a large portion of the project area. A fire that reduces the canopy cover by almost two thirds could also open up the stands and improve regeneration by shade intolerant species such as pine and sequoia.

There is no timber harvest proposed in this project, instead, both action alternatives propose fuel reduction treatments. The most important of these is treating the surface fuel, but they do include thinning of ladder fuels made up of small trees (i.e. intermediate canopy and suppressed) and brush. The canopy structure varies with age, aspect, elevation, slope position, and growing site quality. Table 46 compares overall canopy cover in the high quality old forest habitat areas before and after treatment.

Implementation of Alternative 2 or 3 is not anticipated to substantially alter the vegetation characteristics that are important for old growth habitat in the project area. Existing canopy cover would slightly decrease in the short term. FVS modeling predicts that the weighted average canopy cover would drop to almost the same percentages post implemenation (2020) under either action alternative. The bulk of overhead canopy formed by dominant and co-dominant trees in the stand would not be altered in the existing old forest habitat types available in the project area. In addition, untreated stands exhibiting dense canopy cover (exceeding 61 percent) would continue to exist randomly across the landscape, and contribute to overall forest heterogeneity.

Under either action alternative not all small trees (12 inches or less) would be felled with fuels reduction work. No sequoias would be felled. Those trees left on site are to have good form and potential for growth, with a focus placed on retaining giant sequoia, pine and black oak, over fir and cedar. Thinning small trees, while leaving large and moderate trees in the overstory, would lead to improved stand health, and a diversity of canopy layers.

Under Alternative 1 weighted average live tree basal area in the areas with old growth habitat characteristics was estimated at approximately 326 sq.ft./acre in 2020 with no treatments or wildfires (Table 47).

Table 47: FVS Basal Area Percentage by Alternative in 2020 with and without a Wildfire

Alternative	No Wildfire in 2020 (percent Basal Area)	Wildfire Occurrence in 2020 (percent Basal Area)
Alternative 1 (No Action)	326	118
Alternative 2 (Proposed Action)	309	185*
Alternative 3	306	279*

*Assumes wildfire occurrence after treatments. Treatment for action alternatives includes: (thin, pile burn, jackpot pile burn, understory burn, and felling of imminent hazards) in the areas currently considered suitable old forest habitat types (up to approximately 2,149 acres total).

In contrast, a FVS modeled wildfire in 2020 under the current stand conditions in Alternative 1 suggests that a substantial decrease in live tree basal area would occur, dropping from 311 sq.ft./acre (2020) to an estimated 118 sq. ft./acre (Table 47). Depending on the scale of any one fire event, there is potential that most of the understory basal area would be burned up, and even some of the condominant overstory as well.

Both action alternatives propose retaining the larger trees and thinning the smaller trees in the stands to an average of 70 trees per acre, which is equivalent to 25 foot average spacing. The suppressed understory trees proposed for cutting under this project would have no value for producing lumber. There would be no need to remove merchantable trees to thin smaller trees. It may be possible to use some of the thinned material through the personal use firewood program.

To help reestablish stand resiliency and species composition Alternatives 2 and 3 would retain all trees over 12 inches dbh, and in the following order of preference: giant sequoias, black oak, pines, and an average of hardwoods on a per acre basis. Both action alternatives would include a mitigation measure to protect giant sequoias from fire by having firefighters pull heavy accumulations of fuel away from large giant sequoia trees before prescribed burning.

In Alternatives 2 and 3 FVS modeling predicted that live tree basal area would decrease in treated locations. Comparisons between 2020 values show that basal area would decrease to similar levels under alternative 2 or 3. However, as shown in Table 47, fuels reduction work accomplished in Alternative 3 is anticipated to allow for greater retention of existing basal area under a wildfire in comparison to the other alternatives. FVS predicts basal area would be retained at 279 sq.ft./acre with Alternative 3, which is about one third more than Alternative 2, and over twice as much basal area retention as Alternative 1.

Under Alternative 1, the number and distribution of medium to large live trees is anticipated to slowly increase over the next 50 years. FVS values noted in 2010 were estimated at 19 trees per acre, increasing to approximately 21 trees per acre given normal growth at current stocking levels by 2020. Under No Action with a modeled wildfire (2020), the trend line is similar to that of No Action without wildfire, but then strongly increases starting in 2040. This increase represents growth of remnant trees not consumed by the fire, given decreased competition and lower overall stand density.

The direct effects of Alternative 2 on 1,410 acres, or Alternative 3 on 2,830 acres of the project area would be a decrease in surface and ladder fuel. By felling the suppressed understory trees, this project would temporarily raise the average diameter of trees (Oliver et al. 1996). This effect will disappear in the first decade after treatment because prescribed burning will stimulate a flush of shade tolerant regeneration. The primary treatment will be reducing the amount of surface fuel. The action alternatives would also result in reductions in the canopy, mainly at the lower heights, and exposure of mineral soil.

Under Alternatives 2 or 3, FVS predicts that the number of medium to large live trees and their distribution to remain at relatively the same trajectory as that of Alternative 1 over the first several decades, since large live trees would not be felled. Thinning guidelines for this project also favor the retention of shade intolerant tree species including sequoia and pine and black oak when present. Only small trees (12 inch dbh or less) would be thinned to reduce ladder fuels, but still retain a mix of this size class spaced throughout the understory, and in the planted stands.

Snag levels are not predicted to change substantially based on FVS modeling. However, the type of snag is likely to change. Under Alternative 1, the number of snags in all size classes would continue, with the majority of snags in the intermediate and suppressed canopy. No treatments in Alternative 1 may result in recruitment of larger material as mortality occurs due to overstocked stand conditions, and drought induced stress.

In the short term, snag density is anticipated to slightly increase in Alternative 2 and 3, due to project induced tree mortality (Table 48). In both action alternatives snags would be felled if deemed an imminent safety hazard, but otherwise would be retained. In either action alternative snag felling would generally be confined to road prisms, fuelbreaks and private property interfaces. The majority of snags within the larger project area would be left, maintaining these desirable attributes across the landscape.

Table 48: Average Tree Mortality from Prescribed Burning by Size Class

Mortality (Trees per acre) *	Alt 1	Alt 2	Alt 3
Trees < 15 inches dbh (75 percent of these are seedlings)	none	26	26
Trees 15-17.9 inches dbh	none	2	2
Trees 18-23.9 inches dbh	none	1	1
Trees 24-29.9 inches dbh	none	<1	<1
Trees 30-34.9 inches dbh	none	<1	<1
Trees ≥ 35 inches dbh	none	<1	<1

*Mortality is based on the modeled intensity of pile burning and prescribed fire.

To more clearly display any differences between the alternatives, the planted stands were modeled separately, and with and without a wildfire as shown in Table 48. The proposed treatment of planted stands may increase the proportion of sequoias in these stands, by thinning more trees of other species.

As discussed earlier, both action alternatives propose retaining giant sequoia, black oak, pine, and other hardwoods that have good form and potential for growth. Focusing retention on the more shade intolerant species, particularly sequoias, would alter the species composition and make the planted stands more resilient to predicted changes in climate. Thinning small trees, while leaving the larger-sized trees, would lead to improved stand health and a diversity of canopy layers. In those planted stands where more small trees are present, thinning would lead to accelerated growth, and vigor while reducing inter-tree competition. Reducing surface fuels and the densities of small-diameter stems may be the best means of creating more resilient forests (North et al. 2009, p. vi). Over time this would increase the recruitment and development of larger trees over 12 inches dbh as the planted stands mature.

Cumulative Effects

Most past actions within this analysis area have occurred long ago and are considered part of the affected environment for most resources. One project that was recently completed is the Camp Nelson Project. The Camp Nelson Project reduced surface and ladder fuels by thinning trees up to 10 inches dbh, and contributes towards management desired conditions. There are no other reasonably foreseeable projects currently proposed that may affect vegetation in the TRRP Project at this time.

In the event of a wildfire under Alternative 1, the cumulative effects on tree mortality and reductions in canopy cover could be greatly increased, due to the buildup of surface and ladder fuels over the past several decades. In contrast, in the event of a wildfire after implementing Alternatives 2 or 3 the cumulative effects on tree mortality and reduction in canopy cover would be minimized due to reduction in surface and ladder fuels in the project area, particularly the Black Mountain Grove.

In the long term, implementation of either action alternative, especially if a wildfire occurs, may result in increased acres of CWHR size 4 and 5 habitat types (Parisi et al 2007), and increased opportunities for successful natural regeneration of trees (Beetham 1962, Hartesveldt et al. 1975). However, Alternative 1 could lead to the greatest increase in natural regeneration as a result of a stand-replacing wildfire, due to the modeled decreases in stand density.

Base on the direct and indirect effects of implementing Alternatives 2 or 3, a wildfire occurring in the project area is more likely to be a low-severity fire (Hurteau et al. 2009, Stephens et al. 2009b). The cumulative effect of the fuels reduction treatments would produce a forest structure in the mixed-conifer stands that is more resilient to insect and pathogen mortality at low, chronic levels (North et al. 2009).

This information is drawn from the Silviculturist Report (Powell 2014), which is hereby incorporated by reference.

Effects on Watershed

According to the *Tule River Reservation Protection Project Hydrology Report* (Hydrology Report) (Courter 2014) laws, regulation and policy applicable to managing soil and water quality include the Clean Water Act and Monument Plan. Applicable management direction provided by the Monument Plan is:

- ☒Aquatic Management Strategy (AMS) goals and objectives
- ☒Riparian Conservation Areas
- ☒Riparian Conservation Objectives (RCO) Analysis standards and guidelines
- ☐Critical Aquatic Refuges
- ☐Long-term strategy for anadromous fish-producing watersheds

Critical Aquatic Refuges does not apply because the project is not located inside a designated Critical Aquatic Refuge. Long-term strategy for anadromous fish-producing watersheds applies only to the Lassen National Forest and is therefore not applicable to this project area.

Riparian Conservation Objectives Analysis

The RCOs were reviewed for applicability to the TRRP Project. RCOs 1, 2, 3, and 4 apply to the project and are further reviewed below. RCO 5 does not apply because meadows, lakes, ponds, bogs, fens, and wetlands are not present within the project area and restoration or enhancement is not part of the proposed project. RCO 6 does not apply because restoration of riparian habitat is not proposed in this project. RCOs 1, 2, 3, and 4 contain standards and guidelines. All RCOs that apply are listed here. Each RCO listed has a brief overall objective to achieve when completing the RCO analysis.

☒ RCO 1. Ensure that identified beneficial uses for the water body are adequately protected. Identify the specific beneficial uses for the project area, water quality goals from the Regional Basin Plan, and the manner in which the standards and guidelines would protect the beneficial uses.

☒ RCO 2. Maintain or restore: (1) the geomorphic and biological characteristics of special aquatic feature, including lakes, meadows, bogs, fens, wetlands, vernal pools, springs; (2) streams, including in stream flows; (3)hydrologic connectivity both within and between watersheds to provide for the habitat needs of aquatic-dependent species.

☒ RCO 3. Ensure a renewable supply of large down logs that: (1) can reach the stream channel and (2) provide suitable habitat within and adjacent to the RCA.

☒ RCO 4. Ensure that management activities, including fuels reduction actions, within RCAs and CARs enhance or maintain physical and biological characteristics associated with aquatic- and riparian-dependent species.

☐ RCO 5. Preserve, restore, or enhance special aquatic features, such as meadows, lakes, ponds, bogs, fens and wetlands, to provide the ecological conditions and processes needed to recover or enhance the viability of species that rely on these areas.

☐ RCO 6. Identify and implement restoration actions to maintain, restore or enhance water quality and maintain, restore, or enhance habitat for riparian and aquatic species.

Each Riparian Conservation Objective listed above contains several standards and guidelines, of which only a portion apply to the TRRP Project. Those that apply to the project insure management activities are meeting the overall Riparian Conservation Objective and, ultimately, the Aquatic Management Strategy. The TRRP Project meets all the RCOs applicable to the project. Further detailed analysis can be read in Appendix B of the Hydrology Report.

Best Management Practices

The beneficial uses of water in the project watershed include cold-water fisheries habitat and wildlife habitat. Proper BMP implementation and effectiveness monitoring would serve to protect identified beneficial uses. Forest management and associated road building in the steep rugged terrain of forested mountains has long been recognized as sources of non-point water quality pollution. Non-point pollution is not, by definition, controllable through conventional treatment means. Non-point pollution is controlled by containing the pollutant at its source, thereby precluding delivery to surface water. Sections 208 and 319 of the Federal Clean Water Act, as amended, acknowledge land treatment measures as being an effective means of controlling non-point sources of water pollution and emphasize their development.

Working cooperatively with the California State Water Resources Control Board, the Forest Service developed and documented non-point pollution control measures applicable to National Forest System lands. These measures were termed "Best Management Practices" (BMPs). BMP control measures are designed to accommodate site specific conditions. They are tailor-made to account for the complexity and physical and biological variability of the natural environment. The implementation of BMP is the performance standard against which the success of the Forest Service's non-point pollution water quality management efforts is judged.

The Clean Water Act provided the initial test of effectiveness of the Forest Service non-point pollution control measures where it required the evaluation of the practices by the regulatory agencies (State Board and EPA) and the certification and approval of the practices as the "BEST" measures for control. Another test of BMP effectiveness is the capability to custom fit them to a site-specific condition where non-point pollution potential exists. The Forest Service BMPs are flexible in that they are tailor-made to account for diverse combinations of physical and biological environmental circumstances. A final test of the effectiveness of the Forest Service BMP is their demonstrated ability to protect the beneficial uses of the surface waters in the State.

Best Management Practices, as described in this document have been effective in protecting beneficial uses within the affected watersheds. These practices have been applied in other projects within the Sequoia National Forest. Where proper implementation has occurred there have not been any substantive adverse impacts to cold water fisheries habitat conditions or primary contact recreation (etc.) use of the surface waters. The practices specified herein are expected to be equally effective in maintaining the identified beneficial uses. A stream condition inventory (SCI) plot has been established below the project area in Wilson and Bear Creeks to monitor the effectiveness of the prescribed BMPs.

Potential Concerns for Hydrologic Resources

The proposed treatments in the action alternatives, such as shaded fuel break construction, thinning planted stands, understory burning, surface fuel treatments, and woody debris pile and burning, can have direct and indirect effects on hydrologic resources. Potential concerns associated with these purposed treatments are burn severity, accelerated erosion, deposition, sediment transport, stream stability, changes in water-yield, and stream flow. These concerns are described below.

Burn Severity

A concentration of fuels increases the likelihood of high severity wildfires. High severity wildfires reduce vegetative cover, both across the landscape and riparian areas, and increase the potential for accelerated erosion. Accelerated erosion from precipitation events could potentially deposit sediment into nearby channels, decrease aquatic habitat quality, and change the stream channels geomorphology. Loss of vegetation exposes the stream channel to higher temperatures, which could decrease dissolved oxygen and decrease the quality of aquatic habitat.

High burn severity wildfires can cause both short and long term impacts to hydrologic resources. Increasing the chance of high severity wildfires causes concerns for hydrological resources because they can have adverse effects on water quality and habitat (Keane et al. 2002). Studies after high severity wildfires have documented the impacts to hydrological resources. Robichaud and others have discovered that:

> "The effects of high severity wildfires on runoff and erosion are generally much more severe than the effects of prescribed fires. High severity fires are of particular concern because of the loss of protective cover and fire-induced soil water repellency can induce severe flooding and erosion even after moderate rain events (DeBano et al. 1998; Neary et al. 2005). In severely burned areas, high intensity, short duration rain events have increased peak flows from 2 to 2,000 times (DeBano et al. 1998; Neary et al. 1999, 2005). Published sediment yields after high severity wildfires range from 0.004 to 49 t ac_{-1} yr_{-1}

(0.01 to over 110 Mg ha^{-1} yr^{-1}) in the first year after burning" (Benavides-Solorio and MacDonald 2005; Moody and Martin 2001; Robichaud et al. 2000).

In order to minimize these potential impacts, wildfires or prescribed fires need to burn at a lower severity. Prescribed fire burns at low severity thus minimizing the likelihood of increased peak flows and erosions rates (Robichaud et. al. 2010). Therefore burning at low severity is preferred in order to minimize adverse effects on water quality and habitat.

Accelerated Erosion from Vegetation Removal

Vegetation removal, from wildfire, prescribed fire, or thinning, could potentially allow for accelerated erosion due to higher amounts of exposed soil. Precipitation and/or snow melt events could create gullies, rills, and/or surface sheet flow across the unvegetated and exposed soil. If enough exposed soil experiences accelerated erosion, the possibility increases for sediment movement into nearby streams.

Deposition, Sediment Transport, and Stream Stability

Excessive sediment transport and deposition into stream channels could affect channel geometry, specifically width/depth ratio (wider but shallower stream). High width/depth ratio stream channels are typically associated with increased water temperature, decreased dissolved oxygen, and loss of quality aquatic habitat (Rosgen, 1996). Sedimentation potentially causes a decrease in velocity and stream power[6] which decreases the potential for the channel to transport sediment. This has the potential to reduce stream channel stability by filling pools. Additionally, deposition is often associated with stream bank erosion which further provides a source for sediment (Rosgen, 1996). All of these factors reduce the quality of habitat for aquatic species.

Changes to Water Yield and Stream Flow

Widfire or prescribed fire havet he potential to reduce the soil water storage capacity by removing forest litter, which eventually transfers water into the stream. Removal of forest litter can add the potential for increased surface water yield due to exposed bare soil. Increases in water yield can shorten the duration of stream flow, but increase the intensity. Increased intensity of stream flow can increase stream power, velocity, and sheer stress, which could increase erosion of the stream channel. However, these effects on streams are associated with high burn severity. Prescribed fire operations typically burn at low severity. A study within the Sequoia National Park evaluated the effects of low burn severity in giant sequoia groves. The study discovered the project had no effect on stream flow after burning 12,000 acres (Heard, 2005).

Direct and Indirect Effects

Alternative 1 for hydrology means existing conditions would not change unless a high severity wildfire occurred. Since droughts occur, an increased risk of uncontrolled wildfire exists with this alternative. Water quality and channel stability would not change in the absence of uncontrolled fire. Natural stable, naturally unstable, and stable sensitive channels would remain in the same condition. No potential increases in accelerated erosion and/or deposition into stream channels or changes in water yield or stream flow would occur beyond existing condition until the area is affected by a wildfire and subsequent management action.

All action alternatives include mitigations to reduce soil transport, protect habitat, and promote good water quality. Forest Service soil quality standards are used to minimize the mobility of sediment along the landscape. Streamside management zones (SMZs) and riparian conservation

[6] Stream power is the average rate of kinetic energy supplied and dissipated along a stream channel.

areas (RCAs) are established to protect riparian and aquatic habitat from sediment. Best Management Practices minimize impacts to water quality by implementing mitigations during project implementation and Forest Service personnel evaluate those mitigations' effectiveness once the project is completed. These standards assist in reducing potential impacts from actions/treatments being proposed in each alternative.

The management requirements are designed to address the watershed management concerns. Most are BMPs from the Forest Service publication "Water Quality Management Handbook" (USDA 2011c). To meet this standard and guideline, the BMPs are tailored to meet site specific needs associated with Tule River Reservation Protection Project (Table 2). All applicable water quality BMPs shall be implemented. The implementation phase of the BMPs occur after a project is completed, but before the winter season. BMP monitoring of the project is done one year later after the project has experienced one rainy season. This monitoring will determine if mitigations were not successful and direct or indirect effects have occurred.

Alternative 2 creates a level of burn severity. Burn severity can impact hydrologic resources in several ways. Impacts can result in accelerated erosion, stream instability, sediment transport and deposition into stream channels, changes in water-yield, and changes in stream flow. The proposed treatment of understory burning within the project area is designed to burn at low severity. Low burn severity, as stated from Robichaud and Heard, would have minimal to no effect on hydrologic resources.

The perimeter of the understory burn areas proposed in Alternative 2 would have fire lines constructed by hand and incidental tree felling and pruning. Understory burning is a low burn severity treatment and chances to create increased erosion and increases in water-yield would be minimal (Robichaud, 2010 and Heard, 2005). Further minimizing the potential for negative impacts are the implementation of RCOs and BMPs. In stream monitoring would follow R5 Stream Condition Inventory (SCI) protocol to determine if mitigations were successful in preventing direct or indirect effects.

Similar to understory burning, vegetation removal through piling and burning proposed in Alternative 2 has similar potential regarding accelerated erosion, sediment transport and deposition into nearby streams, and stream stability. Proposed treatments include thinning and brush removal on shaded fuel break and planted stands. Thinning removes some trees and has a minimal impact on hydrologic resources. Brush removal would have a smaller impact compared to thinning. Thinning and brush removal would not occur within the SMZ. To further minimize the potential for negative effects, RCOs and BMPs would be implemented. In stream monitoring would follow R5 SCI protocol to determine if mitigations were successful in preventing effects on aquatic habitats.

Alternative 3 has the potential to affect aquatic resources similar to Alternative 2. Differences are the number of acres treated and an additional treatment. The additional other fuel treatments, bring the total acres treated for Alternative 3 to 2,830.

The other fuel treatments proposed in Alternative 3 focus on reducing surface and ladder fuels in the areas between planted stands and the shaded fuelbreaks. Similar to Alternative 2, these treatments are considered low impact and low severity burn. These treatments follow the RCOs and implementation of BMPs to further reduce the likelihood of any negative impacts to hydrologic sources. Long term monitoring would use the established SCI sites to track changes. The treatments are expected to have minimal effects on hydrologic resources as a result.

Cumulative Effects

The Cumulative Watershed Effects (CWE) analysis incorporates all past, present, and foreseeable activities in each subwatershed. The past and present activities include grazing, wildfire, prescribed burning, timber harvest, road construction and reconstruction, road maintenance, trail construction and maintenance, recreational use, mining and residential development. The Sequoia National Forest Cumulative Watershed Effects model is used as part of this analysis to account for these activities in each subwatershed associated with the project. Under Alternative 1 the risk of wildfire would continue to increase over time as the density of vegetation continues to increase. A high severity wildfire would increase the likelihood of degraded stream channels, a decrease in water quality and habitat quality. Unless a stand-replacing event occurred, cumulative effects would remain the same as listed in Table 21 of the Affected Environment section of this EIS.

The CWE model used assumes all proposed activities would be implemented in the same year, thereby creating a "worst case scenario" for watershed threshold levels. When compared to Alternative 1 with no wildfire, Alternative 2 produces an increase in the percent of Threshold of Concern (TOC) used. The potential CWE modeled for Alternative 2 (treating approximately 1,410 acres) are displayed in Table 49 below and show that none of the subwatersheds are expected to exceed the TOC.

Table 49: Alternative 2 ERAs and Percent TOC Used

Subwatershed (Name/Number)	ERAs Available	Alternative 1* ERAs Used	Alternative 2 ERAs Used	Alternative 2 ERAs Remaining	Alternative 2 Percent TOC Used
Deep Canyon/ 4CA	37.02	1.75	1.76	35.27	4.74
Long Canyon/ 4CB	78.24	0.51	0.51	77.73	0.65
Coffee Canyon/ 4CC	45.63	0.14	0.67	44.96	1.47
Headwaters of Long Canyon/ 4CD	52.80	6.65	7.04	45.76	13.34
Stevenson Gulch/ 4DA	31.26	2.76	2.86	28.40	9.15
Deadman Creek/ 4DB	55.29	6.11	7.30	47.99	13.20
Unnamed/ 4DC	37.83	3.92	4.42	33.41	11.69
Wilson Creek/ 4DD	34.86	0.31	0.34	34.52	0.96
Coy Creek/ 4DE	57.42	25.69	26.14	31.28	45.52
Bear Creek/ 4DF	44.34	11.83	11.83	32.51	26.68
Unnamed/ 4EI	36.12	12.34	12.35	23.77	34.18
Miners Creek/ 4EJ	38.16	0	0.00	38.16	0
Graham SW/ 4FA	22.08	2.65	2.65	19.43	12.02

Analysis of potential effects on aquatic resources indicates Alternative 2 could result in short term disturbances to hydrologic resources (TOC rising slightly from existing condition levels). However, the CWE analysis shows a minimal amount of change to the percent of TOC used. The treatments would produce low effects on the watersheds and, within 5 years, they would return to pre-project conditions regarding potential for erosion and sediment movement (Berg and Azuma, 2008). Implementing Riparian Conservation Objectives and Best Management Practices would further minimize any potential to negatively impact hydrological resources. The potential long-term benefits from Alternative 2 include a reduction in high burn severity wildfire, which could reduce the potential for increased erosion and deposition into riparian areas and stream channels. Alternative 2 would be beneficial for hydrological resources as the effects would not exceed subwatershed threshold levels.

The CWE analysis for Alternative 3 shows a slightly higher percentage of TOC used than in Alternative 2 for most of the subwatersheds. Only two subwatersheds, Deadman Creek and Unnamed (4DC), would have notable increases (approximately 14 and 40 percent increases, respectively, when compared to Alternative 1). This is a logical increase because the majority of the additional 1,500 acres of underburning proposed in Alterative 3 is in these subwatersheds. However, the results of the CWE analysis, displayed in Table 50, show that all of the subwatersheds affected by the proposed project activities would remain within their TOC.

Table 50: Alternative 3 ERAs and Percent TOC Used

Subwatershed (Name/Number)	ERAs Available	Alternative 1 ERAs Used	Alternative 3 ERAs Used	Alternative 3 ERAs Remaining	Alternative 3 Percent TOC Used
Deep Canyon/ 4CA	37.02	1.75	1.76	35.27	4.74
Long Canyon/ 4CB	78.24	0.51	0.51	77.73	0.65
Coffee Canyon/ 4CC	45.63	0.14	0.67	44.96	1.47
Headwaters of Long Canyon/ 4CD	52.80	6.65	7.38	45.42	13.97
Stevenson Gulch/ 4DA	31.26	2.76	3.00	28.26	9.59
Deadman Creek/ 4DB	55.29	6.11	14.06	41.23	25.44
Unnamed/ 4DC	37.83	3.92	18.69	19.14	49.40
Wilson Creek/ 4DD	34.86	0.31	1.19	33.67	3.40
Coy Creek/ 4DE	57.42	25.69	27.94	29.48	48.65
Bear Creek/ 4DF	44.34	11.83	11.83	32.51	26.68
Unnamed/ 4EI	36.12	12.34	12.36	23.76	34.21
Miners Creek/ 4EJ	38.16	0	0.01	38.15	0.03
Graham SW/ 4FA	22.08	2.65	2.65	19.43	12.02

Analysis of potential effects on aquatic resources indicates that Alternative 3 could result in short-term disturbances. However, none of the subwatersheds are over TOC. Within five years, all fire treatments are expected to return watersheds to pre-project conditions regarding erosion and sediment movement (e.g., Berg and Azuma, 2008). Implementation of RCOs and BMPs would further minimize any potential negative effects on hydrological resources. The potential long-term benefits from Alternative 3 include reducing the potential of high burn severity wildfire over a larger area, which could reduce the chances of increased erosion and deposition into riparian areas and stream channels. Alternative 3 would have the greatest potential for positive effects on hydrologic function.

This information is drawn from the Hydrology Report (Courter 2014), which is hereby incorporated by reference.

Effects on Wildlife

The following effects discussion is summarized from the *Biological Assessment for the Tule River Reservation Protection Project* (Wildlife BA) (Galloway 2014a) and the *Biological Evaluation for the Tule River Reservation Protection Project* (Wildlife BE) (Galloway 2014b). These documents can be found in the project record on file at the Western Divide Ranger Station.

Endangered, Threatened, and Proposed Species: California Condor

Analysis Indicators

Analysis indicators are presented in the environmental consequences section to compare and contrast the effects of the project alternatives on the California condor (Gymnogyps californianus). The primary indicators selected were based on a thorough review of the literature and informal discussion with the USFWS Condor Recovery Team on the interaction between condors and fuel reduction projects.

Indicator 1: Disturbance related impacts from project actions

Koford (1953) reported that increased noise levels and motion may negatively influence selection of roost sites or normal use of existing roost sites for a period of time.

Indicator 2: Changes in the availability and distribution of large snag and live trees (≥24 inches diameter):

Retaining a series of large roosting structures (snags or large live trees) across the landscape is important for the condor. This concern is heightened in areas up slope of designated critical habitat such as northwest of the TRRP Project. Project activities that substantially alter these structural elements may negatively influence condor habitat.

Indicator 3: Change in the availability of potential nest trees (giant sequoias).

Historically large giant sequoia trees with suitable cavities have been utilized by the California condor for nesting purposes. Actions that would result in the loss of large giant sequoia trees that contain cavities of sufficient size suitable for nesting purposes may decrease nesting habitat.

Data Sources

Geographic information system (GIS) base layers and condor roost areas as identified in the Forest Plan, historical observation data from 1982 through 1987, and satellite telemetry data by season through October of 2002, were provided by the USFWS (Ventura Fish and Wildlife Office GIS, August 2003). Global Positioning System (GPS) location data was provided by USFWS from 2009 to present. Mapped areas of Critical and Essential Habitat were taken from the 1984 and 1996 California Condor Recovery Plans.

Direct and Indirect Effects

Indicator 1: Disturbance-related impacts from project actions

Alternative 1: Under Alternative 1 the project would not be implemented and therefore, no change to ambient noise levels would occur. Any existing intermittent or transient use by condors would continue.

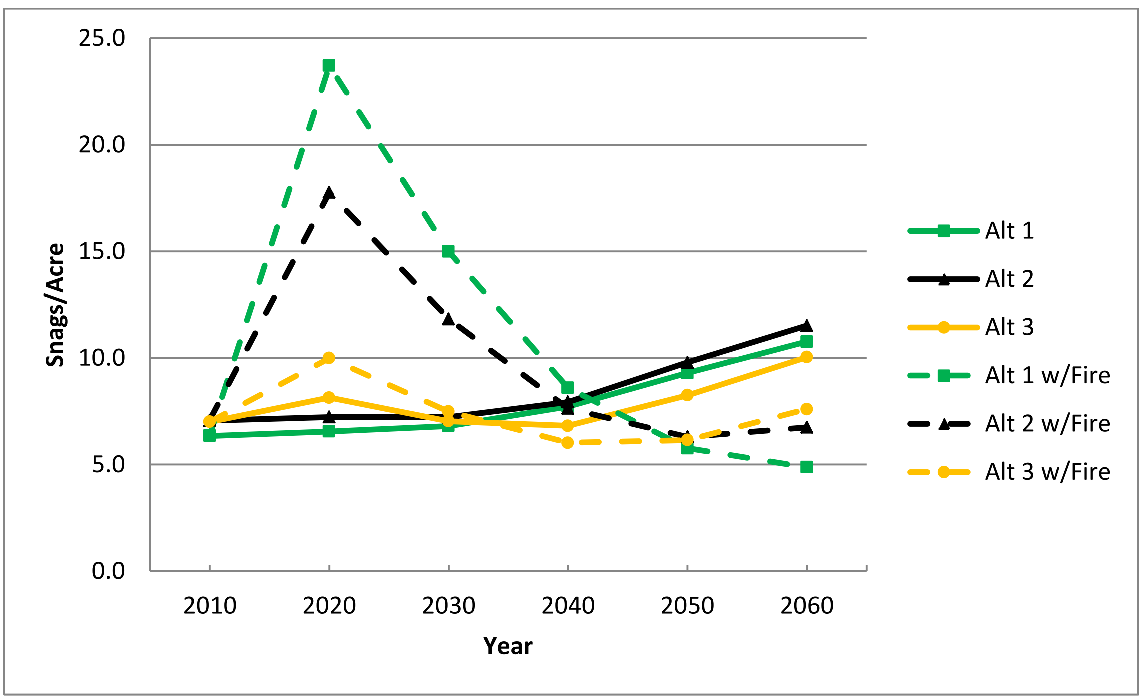
Alternative 2 and 3: These alternatives propose activities that have the potential to cause disturbance which include increased vehicle noise, workers' presence, smoke from burning activities, and equipment noise for short or extended periods throughout the work day. Duration of project implementation is not known but is anticipated to span several months (late summer to fall) for a period of two to four years, depending on alternative.

Historic use of the forest by condors included flight paths that follow the west slope of the Greenhorn Mountains, north across the Tule River Indian Reservation, and then further north to Blue Ridge. The TRRP Project area lies within this historic flight corridor. Although there is suitable habitat for roosting and nesting, there are no known occurrences of nest or roost sites used with sufficient frequency to define them as an historic use site within the project area. Roosting has occurred northwest but outside of the project area along the upper two-thirds of the slope in the Long Canyon drainage as late as summer of 2012 by a single individual. Duration of the visit extended only for an overnight period. Based on a review of satellite data since 2009, this is the only known occurrence of a roosting condor within approximately four air miles of the TRRP Project area. Given the limited number of visits to the forest and short duration of condor use, opportunities for disturbance-related effects from project actions are anticipated to be negligible. Monitoring of satellite data showing any condor use of the forest is ongoing. Should satellite data indicate the potential for use of the TRRP project area; appropriate Limited Operating Periods (LOPs) would be implemented.

Indicator 2: Changes in the availability and distribution of large snags and live trees:

Under Alternative 1 for snags and live trees greater than 15 inches dbh, estimated snag densities and large live tree availability are anticipated to gradually increase over the next 50 years, as displayed in Figures 23-25. Figure 23 displays snags were greater than 15 inches dbh, and figures 24 and 25 display snags greater than 24 inches dbh. Distribution of these elements would remain throughout the TRRP project area. In contrast, implementation of either action alternative shows snag and large live tree numbers would also slightly increase or remain near No Action levels over the same modeled cycle (Figures 23-25).

Figure 23: Weighted Average Snags Per Acre (> 15 inches dbh) for TRRP Project Area by Alternative with a modeled Wildfire reflected in 2020



An analysis of a potential wildfire and its effect on important stand elements was conducted for the TRRP Project. A modeled wildfire was sequenced to occur in the first decade, with results reflected in 2020. For Alternatives 2 and 3, the wildfire was initiated following fuels treatments as proposed. For the No Action Alternative, the wildfire was sequenced at the same time period as that of the Action Alternatives for comparison purposes.

Based on this analysis the trend line displaying the number of snags (greater than 15 inches dbh) is shown to dramatically increase post fire, with values declining in number rapidly within the first two decades (2020-2040). Snag densities would eventually reach a lower level than noted under Alternative 1 without wildfire, as evidenced by the trend line in 2040. The availability of snags in the largest sizes classes (greater than 24 inches dbh) would also increase post wildfire, as shown in Figure 25, but would remain on site slightly longer because of their size class, and would also gradually decrease over time. The dramatic increase in the number of snags of all sizes associated with the wildfire is a result of small live tree mortality that would occur at current stand densities.

Under Alternative 2, the modeled wildfire effects show an increase in the number of snags greater than 15 inches dbh immediately after the wildfire, but approximately 25 percent less than noted under Alternative 1 with wildfire (Figure 23). As with the No Action Alternative, a precipitous decrease in snag numbers occurs over time, falling to approximately one snag less than at the beginning of the modeling cycle.

The modeled wildfire effects also show an increase in snags greater than 15 inches dbh immediately after the wildfire. The decrease in snags over time is much more gradual, with snags greater than 24 inches dbh and remaining at higher levels than at the start of the modeling cycle.

Figure 24: Weighted Average Live Trees (≥24 inches dbh) Per Acre for TRRP Project Area by Alternative with a modeled Wildfire reflected in 2020

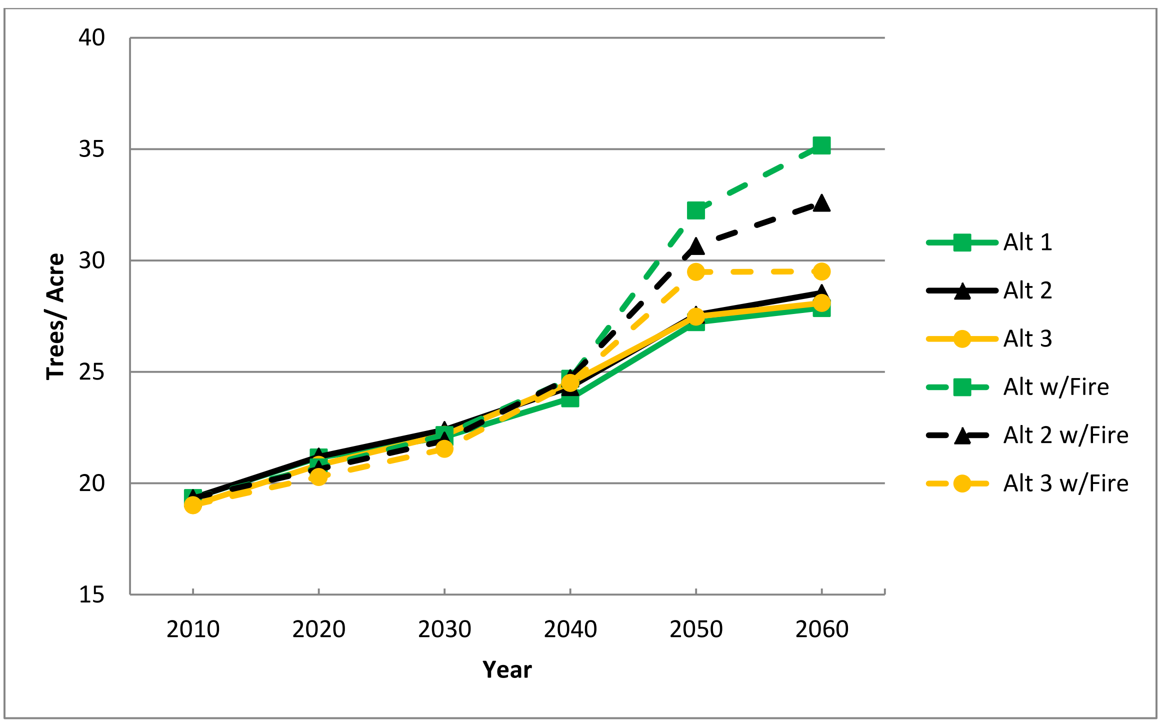
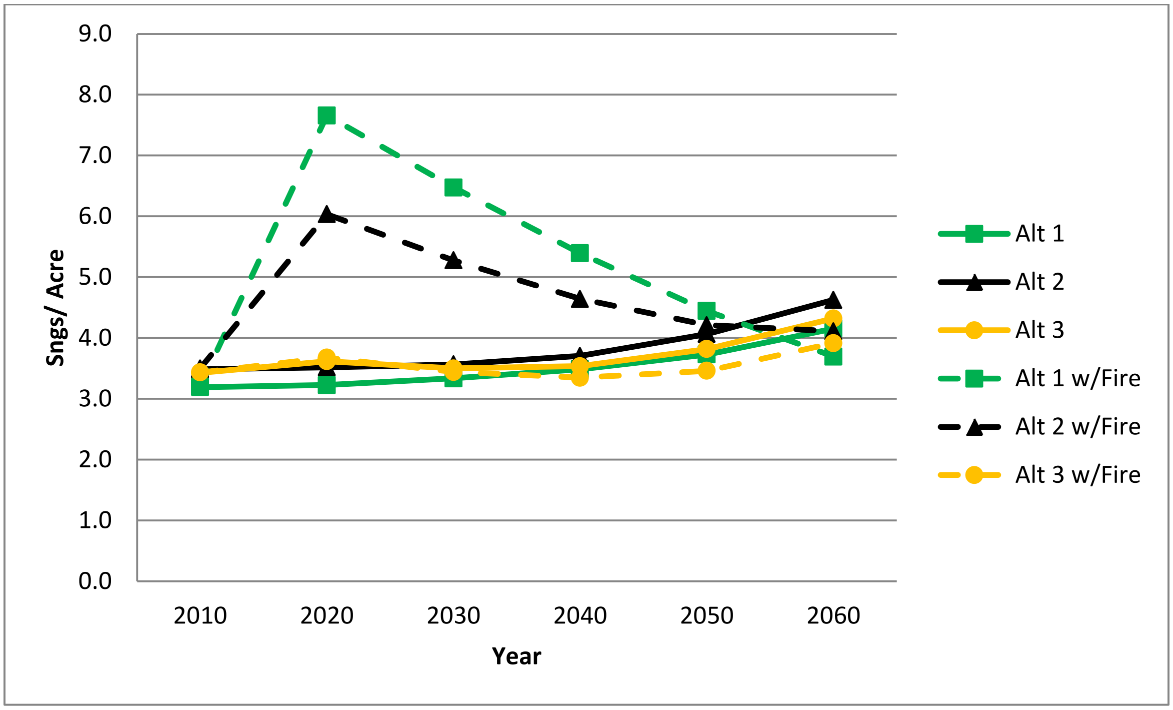


Figure 25: Weighted Average Snags (>24 nches dbh) for the TRRP Project Area by Alternative with a modeled Wildfire reflected in 2020



All of the alternatives with fire maintain trend lines that show little decrease in the number of large live trees (greater than 24 inches dbh) initially with or without treatment over time (results reflected in 2020, Figure 24). An increase in the number of live trees in larger size classes was also predicted to occur after 2040 with each alternative with fire, as residual smaller trees that were not killed by the fire are released, and are able to grow freely given lower stand densities (Figure 24).

Under Alternatives 2 and 3, there is little potential to cause a change in the availability and distribution of snags or large live trees. Modeling of snags greater than 15 inches dbh shows no decrease in existing snag numbers over time. Instead, there is a steady increase. Live tree felling is restricted to trees less than or equal to 12 inches dbh or less, with snag felling limited to imminent hazards. Large live trees greater than 24 inches dbh also show a steady increase over time (Figure 24). Therefore adequate large live trees and snags are anticipated to remain after project implementation for any future condor use that may occur. Under Alternative 2 the effect of the modeled wildfire showed an increase in the number of snags greater than 15 inches dbh immediately after the wildfire but approximately 25 percent less than noted under Alternative 1 with wildfire (Figures 23 and 24). As with the No Action Alternative, a precipitous decrease in snag number occurs over time falling to approximately one snag less than at the beginning of the modeling cycle.

As is the case with all the alternatives, there is little change in the number of large live trees (greater than 24 inches dbh) initially post wildfire until around 2040, where trend lines for each alternative with fire exceed those noted with no wildfire. In Alternative 2, the increase is about six percent less than in the No Action Alternative. In Alternative 3, the number of available large trees remains closest to what occurs in Alternative 1 in the absence of fire.

Indicator 3: Change in the availability of potential condor nest trees (giant sequoias).

It is anticipated there would be no change in the availability or distribution of large giant sequoia trees with a selection of Alternative 1 since no fuel reduction actions would occur. Any existing giant sequoia trees with potential condor nest cavities would remain.

Under Alternative 2 or 3 there is little potential for a change in condor nest tree availability. Large giant sequoia trees with adequate cavity sizes to be utilized as nest trees are not being felled. Only trees 12 inches in diameter or smaller are to be felled, with an emphasis on retaining giant sequoia, oak, and pine.

Cumulative Effects Analysis

For the purposes of this analysis, the vegetation layer utilized for baseline estimations of habitat was created from remote-sensing imagery obtained at various points in time, which are verified using photo-imagery, on-the-ground measurements, and tracking of vegetation-changing actions or events. The vegetation layer was updated in 2003 to reflect changes from the McNally Fire, and in 2010 with project specific stand exams. Past actions in the context of this analysis outside of the TRRP project area refer to those actions that have occurred since the last forest mapping in 2002 and as updated in 2003 (i.e. 2002 to present).

Defining the Cumulative Effect Analysis Area: Condors are able to traverse much of the forest in a day, so the assessment boundary for cumulative effects encompasses 222,250 acres. This area includes the southern portion of the Giant Sequoia National Monument and the majority of known roost locations and the historic nest site at Starvation Grove within the Western Divide Ranger District.

The TRRP Project action alternatives in light of past, present, and reasonably foreseeable actions would not result in negative influences to the California condor or its habitats. Table 51 provides applicable summary information for habitat in the cumulative effects analysis area. Values were calculated for Alternative 3, since this alternative would treat the most acres and could have the greatest potential influence. Alternative 2 treats approximately half of the available acres of suitable habitat treated by Alternative 3. Prior commercial harvest or fuels reduction projects on Forest Service Lands since the last mapping update in conjunction with the proposed action encompassed less than five percent of the available habitat for the California condor (Table 51), while actions on non-Forest Service lands are anticipated to have minimal influence on individuals or their habitats at less than one percent. Silvicultural prescriptions for previous Forest Service projects were crafted under the SNFPA FEIS (USDA 2001). The TRRP Project complies with the Monument Plan specific standards and guidelines to retain all large live trees, which include snags (30 inches dbh and greater) unless deemed a safety hazard, and to retain an adequate recruitment pool of mid-sized trees to provide for their replacement overtime.

Fire History: No wildfires of significant size have occurred within the cumulative effects analysis areas established for the species addressed since the last mapping update.

Recreational Activity: Recreation activities at designated campgrounds would remain similar within cumulative effects analysis areas, and are generally tied to road and trail related activities such as hiking and equestrian. Off-highway vehicle and over-snow vehicle (OHV/OSV) use is restricted to designated trails and roads within the Monument.

Livestock Grazing: The majority of the established cumulative effects analysis area contains portions of 17 grazing allotments under permit. Livestock grazing does not alter the distribution or availability of large live trees or snags that may serve as roost structures. Livestock grazing has been an ongoing activity prior to the establishment of the Forest, and is presently at substantially lower levels than what historically occurred. The presence of livestock in the cumulative effects analysis area may have beneficial consequences for the condor. Livestock occasionally die through predation or natural causes and can provide an incidental food resource.

Actions on State or Private Land

There are approximately 16,530 acres of non-Forest Service lands within the cumulative effects analysis area comprising about seven percent (Table 51). Reviews of past and foreseeable actions on non-Forest Service land were evaluated through available timber harvest plans (THPs) registered in Tulare County between 2002 and 2011. These actions are only applicable to the cumulative effects analysis area identified for the California condor. Past, present and foreseeable actions were estimated to include 1,357 acres on non-Forest Service land, which is less than one percent of the cumulative effects analysis area. All harvesting on private land employed selection cut prescriptions, which may have included commercial thinning.

Table 51: Summary of Past, Present, and Foreseeable Actions for California Condor Cumulative Effects Analysis Area

Activity	National Forest	Non-National Forest
Suitable Habitat (Acres)	205,420	16,830
Past/Current Commercial Thin and Associated Fuels Treatment (Acres)	2,228	1,357
Past/Current Fuels Reduction Projects (Non-commercial Thin and Burn) (Acres)	5,102	0
Habitat Affected by TRRPP Action Alternatives (Acres)	2,830	0
Total Habitat Affected by Past, Present, and Foreseeable Actions (Acres)	10,170	1,357
Cumulative Effects Analysis Area (Percent)	<5	<1

The TRRP Project Action Alternatives in light of past, present, and reasonably foreseeable actions would not add a significant decrease in the availability or distribution California condor habitat or its use. The TRRP Project does not overlap with any designated critical habitat.

BA Determination

Although there have been no known roosting or nesting occurrences to date within the TRRP Project area, the project area lies within the range of the species. Noise disturbance from implementation activities has the potential to flush individuals should they be within or near the project area; therefore it is the District Biologist's determination that the preferred alternative, Alternative 3, of the Tule River Reservation Protection (TRRP) Project **may affect but is not likely to adversely affect** the California condor, and **no affect** for California condor designated Critical Habitat. The project area is removed from any designated critical habitat.

Forest Service Sensitive Species

All alternatives were evaluated in the context of the activities proposed and actual acres treated. Table 52 provides the primary indicators and metrics used to assess changes, and to evaluate the environmental consequences for each species by alternative. Suitable habitats using the CWHR classification were evaluated by the District Silviculturist based on stand exam data. The Forest Vegetation Simulator (FVS) along with the Fire and Fuels extension were used to model vegetation changes for all alternatives. Points of comparison include the following: 1) Existing condition 2010; 2) No Action Alternative (no treatment) and action alternatives with fuels treatment reflected in 2020; and 3) The No Action Alternative with modeled wildfire (2020), and Action Alternatives with fuels treatment followed by a modeled wildfire (2020).

Table 52: Selected Primary Metrics Used to Assess Effects on Species

Species Name	Indicator of Change
California spotted owl, northern goshawk, fisher, and marten	**Metric 1. Acres treated and change in project area CWHR score for suitable habitat types.**
	Metric 2. Change of desirable stand characteristics which are most at risk and difficult to replace in suitable CWHR types: • Change in dense canopy cover. • Change in ive tree basal area (sq. ft./ac), and the availability of large trees. • Change in the availability of snags (≥15” dbh). • Change in the availability of large woody debris. • The degree to which fuels treatments may reduce the potential for the loss of above attributes from future wildfire events.
California spotted owl, northern goshawk, and fisher	**Metric 3. Acres treated and change in CWHR score for PACs/PFAs, PACs/HRCAs and Den Buffer[7]:** • spotted owl PAC/HRCAs. • northern goshawk PACs/PFAs. • fisher den buffer.
Pallid bat and fringed Myotis bat	**Metric 4. Change in snag density and distribution.**
	Metric 5. Change in the availability of large giant sequoias

Metric 1: Acres treated and change in project area CWHR score for suitable habitat types. This metric evaluates suitable habitat as a whole. Project actions producing alterations in vegetation size and/or density classification will be reflected through a change in relative CWHR score. Habitat suitability scores are calculated for each wildlife species based on vegetation type, size and density classifications identified as suitable habitat, and then weighted by the total number of acres of each habitat within the analysis area. Values for the differing sizes and densities within each habitat type vary from 0.00 to 1.00. A value of 1.00 is the highest value assigned to any size and density within a habitat classification and is considered to be of greatest value to the species considered. Values below 1.00 can therefore be considered a proportion of the maximum value assigned to the habitat classification for the species.

In addition, CWHR uses four habitat suitability levels or indexes to rate habitat for species occurrence and its ability to support population densities with pre-defined habitat values. These suitability levels and assigned values are: 0.00 unsuitable, 0.33 low, 0.66 medium, and 1.00 high. A

[7] No marten den buffers occur in the TRRP Project area.

habitat level of high is considered optimal for species occurrence and can support relatively high population densities at high frequencies. Conversely, a habitat level of low is considered marginal for the species and can support relatively low population densities at low frequencies. Therefore, inferences of population density and occurrence frequency using CWHR habitat suitability index can be determined.

Metric 2: Change of desirable stand characteristics which are most at risk and difficult to replace in suitable CWHR types. Scientific research regarding the species addressed has identified various structural attributes found to be important based on their use and occurrence in occupied habitats. This metric tracks the anticipated changes in these structural features given each alternative (pre and post condition) and over time using FVS modeling.

Metric 3: Acres treated and change in CWHR score for PACs/PFAs, PACs/HRCAs and Den Buffer. PACs and den buffers have been established around documented nest and den sites found through field survey. CWHR scores were calculated for each of these areas, and will be tracked to gain an understanding of how proposed actions may alter their suitability similar to Metric 1.

Metrics 4 and 5: Change in snag density and distribution, and change in the availability of large giant sequoia trees. Medium to large snags and large basal hollows within giant sequoia trees are structural elements used by the bat species addressed. Changes in the number and amount of these features may lower habitat quality. These metrics track changes in these attributes by alternative.

Effects Common to All Species for Alternatives 2 and 3

Direct and Indirect Effects

Alternatives 2 and 3 propose to treat an estimated total of 1,407 to 2,825 acres within the TRRP project area, respectively. All habitat and treatment acres in the project area were generated using GIS mapping software. These values are approximate and may vary slightly between treatment areas and CWHR totals based on specific habitat characteristics. The potential effects related to increased disturbance levels and fuel treatment operations would be similar and are discussed once here for brevity purposes. Alternative 2 treats the lowest overall acreage likely resulting in the least short term influence; however, it also presents compromises toward the long-term outcome for maintaining habitat resiliency through time (See detailed discussions under Alt. 1-3).

Disturbance: Fuels reduction operations have the potential to increase levels of disturbance affecting sensitive species. This can result in temporary or prolonged nest/den abandonment with a loss of reproductive recruitment, injury or death of an individual from felling of a hazard tree unknowingly being used, to short term alterations in habitat use or foraging patterns.

The Monument Plan standards and guidelines impose limitations on resource management activities in efforts to be consistent with strategies and desired conditions for these species. These standards and guidelines include the use of appropriate limited operating periods (LOPs) to reduce disturbance during critical time frames of the breeding season. LOPs would restrict thinning or fuel treatments within ¼ mile of any designated PAC for the duration of the reproductive season (spotted owl = March 1-August 15, goshawk= February 1-September 15). LOP restrictions for fisher (March 1-June 30) and marten (May 1-July 31) would be applied over the entire project area since maternal and natal den sites are often not known and could be present within the project area. Applied LOPs, as discussed, would also benefit the bat species addressed, since their reproductive periods occur within the same time frames.

Some large snags may be felled and left on site where an imminent hazard to personnel exists. While this may negatively impact individuals if present in a tree when felled, the potential for this risk is low. Most hazard tree felled would occur within shaded fuel breaks located along roadsides, ridgelines, and adjacent to private property. Habitats in these instances have been previously compromised through their initial construction or development, and ongoing levels of human use and maintenance. The majority of forest interior species such as the spotted owl, goshawk, fisher, or marten will select nest, roost, or den sites away from these areas. Shaded fuel breaks located along major ridgelines do not represent habitat of high value that would be used consistently by the species addressed. The thinning and fuels reduction operations target the removal of only small trees (12" dbh or less), brush, and existing surface fuels, which are not suitable for roost or den purposes. The intent of the project is to work in such a way as to retain large live trees and the majority of large snags, with either action alternative. Project implementation for fuels reduction work would not occur across the entire project area at one time, but would be accomplished and staged in manageable blocks. Limiting block size, coupled with use of stated LOPs, would provide habitats without these increased activity related effects.

Fuel Treatment Effects (pile and burn, jackpot pile and burn and understory burn): Fuel reduction work is not anticipated to result in large decreases in habitat quantity or quality. All burning associated with this work would be conducted under controlled conditions, which lower fire severity and impacts to forest stands. Some torching of individual trees, or groups of trees, may occur resulting in some small openings. This will allow for minimal increases in stand heterogenity. Additional edge habitat may become more evident over the short term between existing mature stands and the thinned planted stands, located on the west side of the project area. All of the above species have been noted to opportunitistically forage along such edge environments provided that mature habitat remains adjacent to more open habitats. Individuals may experience an increase in prey detection and capture over the short term (1-3 years). Pile burning and jackpot pile and burn operations allow increased flexibility to maintain desirable stand attributes such as large giant sequoia trees or other large conifers, large woody debris, and large snags.

Differences or shifts in prey composition or relative abundance of prey items may occur, as fire alters habitats to favor some prey species and negatively influences others. The general trend noted in the literature, however, indicates that while compositional changes in prey may occur, prey density levels remain realtively stable. Small tree thinning and brush removal associated fuel reduction activities are not anticipated to dramatically affect key prey resources utilized by the California spotted owl. The flying squirrel is associated with mature forests with dense canopy (greater than 50 percent), in relatively close proximity to perennial streams (Myer et al. 2005). Nests are located in cavities in live and dead trees at the mid canopy level. Little appreciative change in the availability of large live trees, overhead canopy, or riparian environments are anticipated, and thereby would continue to provide habitat generally acceptable for the flying squirrel. Some loss of medium to large snags across the project area is expected due to the removal of imminent hazards. However, snag levels are not predicted to change substantially based on FVS modeling. Woodrat habitat may be more vulnerable in planted stands where pole size tres and dense brush exist. Woodrat nests can be located closer to the ground and lost through burning operations. The primary use of pile and burn, or jackpot pile and burn, methods would leave many places unaffected by fire. Impacts from understory burning would also not consume all treated areas due to differences in vegetation, soil moisture, topography and aspect, and timing of the burn (usually fall). Collectively, actual blackened acres would be significantly smaller than the entire unit, and various islands of untreated habitat would remain. Woodrats and other spotted owl prey species have evolved in the presence of frequent, low-to-moderate intensity fires, which would be mimiced under controlled conditions. Therefore, long term or substanctial impacts are not anticipated.

The northern goshawk forages over a wide variety of forest environments including both closed and moderately open canopies. It feeds on a diversity of both mammal and bird species all of which are relatively common on the landscape, and are habitat generalists themselves. None of these prey species have been noted to be at risk or in decline. Many find niche habitats along downed logs or use snags as a form of cover or for food resources. Adequate snag levels (6.6-7.2 snags per acre), ground cover, and large woody debris (average 15 tons/acre, range of 10 to 20 tons per acre) would remain post treatment.

The fisher and marten are prey generalists eating a wide diversity of items, including small to mid-sized mammals, birds, fruits and nuts, vegetation, and carrion. Martin (In: Buskirk and Powell 1994) suggests that their ability to adjust predatory patterns and prey type are important factors that enable them to balance energetic needs. The broad array of food items utilized by these species, and the limited nature of the expected treatment in context of the larger landscape, eliminates concern for substantial shifts in food resources.

Studies involving bat response to small tree thinning and fuels treatment, including wildfires, generally suggest a neutral to a positive benefit for many species groups (Loeb and Waldrop (2008), and Buchalski et al. 2013). Loeb and Waldrop (2008) in their study involving big brown bats, eastern red bats and eastern pipistrelle bats showed that activity was significantly greater in thinned stands; intermediate in activity with burn and thin stands or with burn only stands; and lesser in activity in control stands. The decrease in the clutter of small dense trees was thought to improve foraging and commuting activity for bats in the Piedmont region. Humes et al. (1999) found bats to be more active in old-growth and thinned forest stands than in dense, un-thinned stands, suggesting that the increased structural diversity benefitted bats.

A recent study by Buchalski et al.(2013) evaluated the effects of wildfire severity on bats at both stand (greater than 1 hectare) and landscape scale in response to the 2002 McNally Fire on Sequoia National Forest. Surveys of echolocation activity were conducted one year post fire stratified in riparian, upland habitat, and mixed conifer forest habitat spanning three levels of burn severity (unburned, moderate and high). Results from this study in mixed conifer forests found no significant negative effects of fire on bat activity. The fringed myotis bat demonstrated increasing magnitude of activity response with burn severity, and the pallid bat showed a positive threshold response to fire (no differentiation of fire severity but positive fire response). The study found no significant negative effects of fire on bat activity in mixed conifer forests with this large and severe wildfire, supporting the view that bat communities are resilient to fire and that fire may enhance foraging opportunities. The study also suggested that factors that drive use of forest habitats (e.g. foraging opportunity, prey species) were functionally equivalent post fire to landscapes with mixed-severity fire.

Direct and Indirect Effects

California Spotted Owl And Northern Goshawk:

The California spotted owl and northern goshawk are addressed in the same section since they use the same vegetation types for nesting/roosting purposes and have overlapping territories in the TRRP Project area.

Metric 1. Acres treated and change in project area CWHR score for suitable habitat types:

Alternative 1 (No Action) - A selection of the No Action Alternative would defer small tree thinning, brush removal and associated prescribed burn entries at this time. Existing suitable spotted owl and goshawk habitat (2,137 acres) and its distribution would not be altered. The calculated CWHR score for suitable habitat is displayed for Alternative 1 in Table 53. The existing CWHR score was estimated at 0.811 in 2010, with FVS predicting a slight increase in score (0.892) by 2020 without treatment.

A continued risk for uncharacteristically severe wildfire under summer conditions would remain, given the vegetation types present, existing fuel loads, topography, and the number of fire return intervals missed (see Fuels discussion). Based on these conditions a wildfire is anticipated to generate flame lengths in excess of 20 feet in height, over 80 percent of the project area. It is also estimated that approximately 85 percent of the project area would support both passive and active crown fire. Under this scenerio a substantial decrease in CWHR score was predicted with the value dropping to aproximately 0.292, suggesting a reduction in habitat suitability (Table 53). This is a result of tree mortality and loss of overhead canopy which result in changes to some cover classifications.

Table 53: Estimated CWHR scores by Alternative for Suitable Habitat Types for California Spotted Owl and Goshawk

Alternative 1 (No Action)			Alternative 2		Alternative 3	
Existing Condition 2010	No treatment or Wildfire 2020	No treatment with Wildfire 2020	Treatment* with No Wildfire 2020	Treatment with Wildfire 2020	Treatment with No Wildfire 2020	Treatment with Wildfire 2020
0.811	0.892	0.292	0.850	0.516	0.809	0.806

*Treatment for action alternatives includes: (thin, pile burn, jackpot pile burn, understory burn, and felling of imminent hazards). All CWHR scores are based on suitable vegetation type (size and density), stand exam data, FVS and fuels extention model results, acres, and CWHR scoring system,.

Alternative 2 - This alternative would treat approximatley 967 acres (45 percent) of suitable spotted owl and goshawk habitat in the project area. This includes 479 acres in shaded fuel breaks, 261 acres within the understory burn, 119 acres in PACs, and 108 acres in planted stands. The bulk of the habitat impacted is located in shaded fuelbreaks that would be created or maintained along roads, ridges, and along private property in relatively narrow bands (max 300 ft.). Work would thin small trees and brush leaving all medium and large live trees with existing canopy. Based on the acres treated and changes reflected through FVS modeling, the CWHR score for Alterantive 2 shows little appreciative change to that of No Action (2020) (0.850 to 0.892 respectively) for suitable habitat (see discussion under Metric 2). Fuel reduction work results in little to no change in CWHR size and density classifications associated with suitable vegetation types, therefore the CWHR scores are not markedly different. Values for suitable habitat following fuels treatment and a subsequent wildfire (2020), show a higher score at 0.516 for

Alternative 2, than with Alternative 1 at 0.292 where no fuel reduction work occurs prior to the wildfire.

Alternative 3 - Alternative 3 would treat approximatley 2,122 acres (99 percent) of the suitable habitat in the project area. This includes 441 acres in shaded fuel breaks, 219 acres within the understory burn, 450 acres in PACs, 108 acres in planted stands, and 904 acres of other fuel treatments. Based on the habitat acres treated and changes reflected through FVS modeling, Alternative 3 would result in a small decrease in the CHWR score for suitable habitats from 0.892 (No Action 2020) to 0.809 post treatment, a difference of 0.083 (Table 53). These values reflect that there is little change in existing vegetation size and density classifications of CWHR types present and therefore do not represent a substantial change to habitat quality.

When CWHR scores are evaluated post treatment followed by a wildfire, Alternative 3 remains with the highest score at 0.806 in comparison to the other two alternatives (Table 53).

Metric 2. Change of desirable stand characteristics which are most at risk and difficult to replace in suitable CWHR types:

Change in dense canopy cover, live basal area, number and distribution of large live trees, snags and woody debris :

No Action - Without treatment, FVS modeling of suitable CWHR habitat types suggests that stands would exhibit a slight increase in both canopy cover and live tree basal area by the end of the first decade (2020), and then plateau or have minimal increases from 2020 through 2060 (Figures 26 and 27). Weighted average canopy cover in 2010 was estimated at 62 percent, increasing to an estimated 65 percent by 2020. These values lie within the range identified for nest and roost sites occuppied by the spotted owl (60 to 95 percent) and northern goshawk (50 to 100 percent) as noted through scientific literature, and localized field observations made on Sequoia National Forest.

Weighted average live tree basal area for suitable CWHR vegetation types at baseline (2010) was estimated at 311 sq. ft./acre, increasing to approximately 326 sq.ft./acre by 2020 (Figure 27). These values are also well within the range noted for occupied nest/roost habitats of 180-350 sq.ft./acre (both species).

Under existing stand conditions with a modeled wildfire reflected in 2020, FVS suggests that a substantial decrease in both canopy cover and live tree basal area would occur. Canopy cover would drop from 65 percent (2020) to an estimated 21 percent (Figure 26), with live tree basal area dropping from 311 sq.ft./acre (2020) to an estimated 118 sq. ft./acre (Figure 27). These conditions, depending on the scale of any one fire event, have the potential to render habitat unsuitable for the spotted owl and northern goshawk.

Figure 26: Weighted Average Percent Canopy Cover for Suitable CWHR Habitats for the California Spotted owl and Goshawk by Alternative, and with a Wildfire Modeled in the First Decade Reflected in 2020

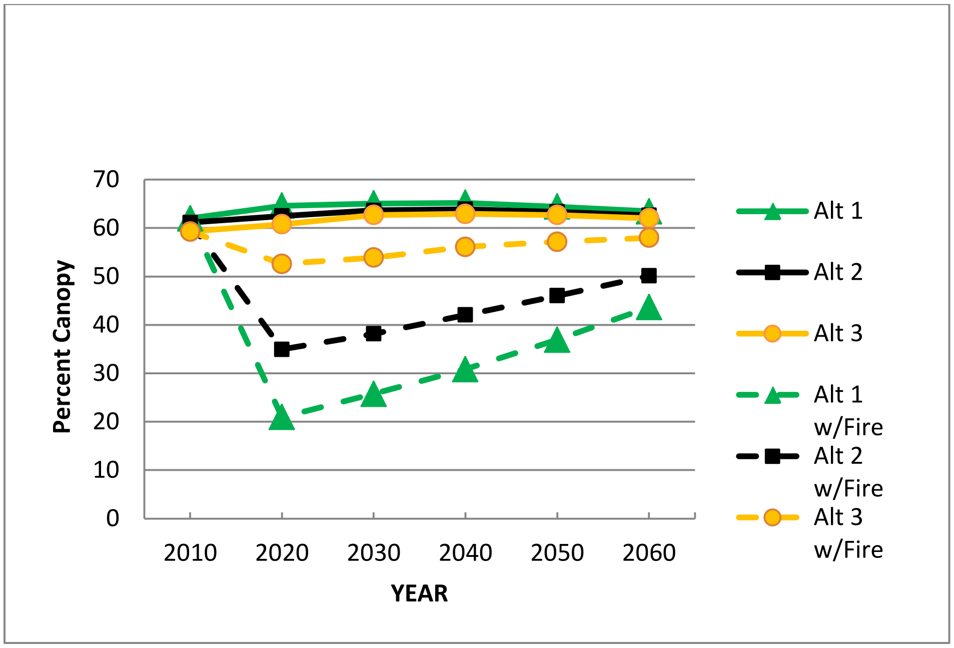
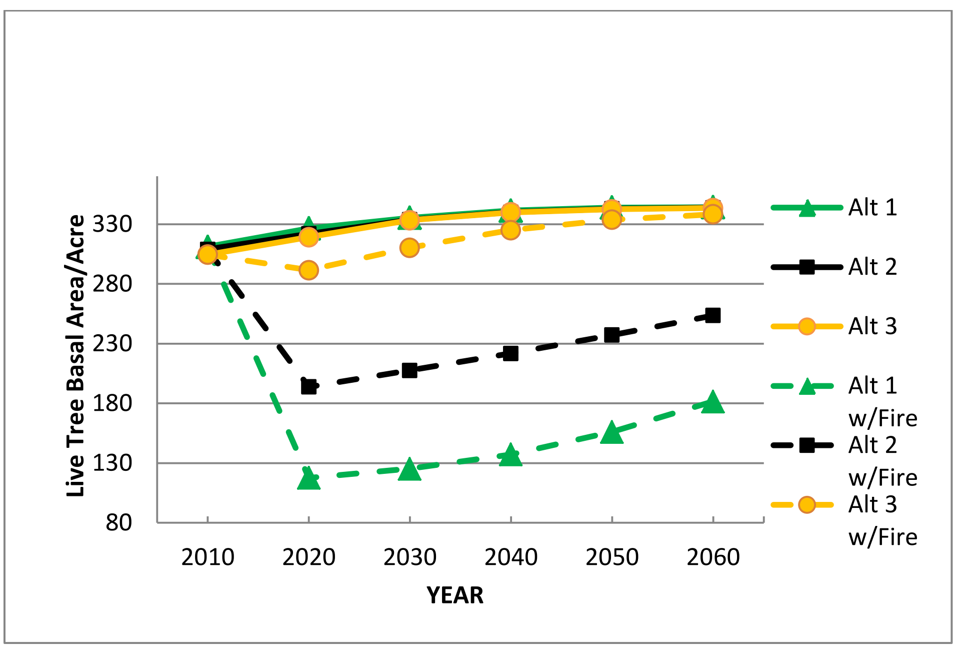
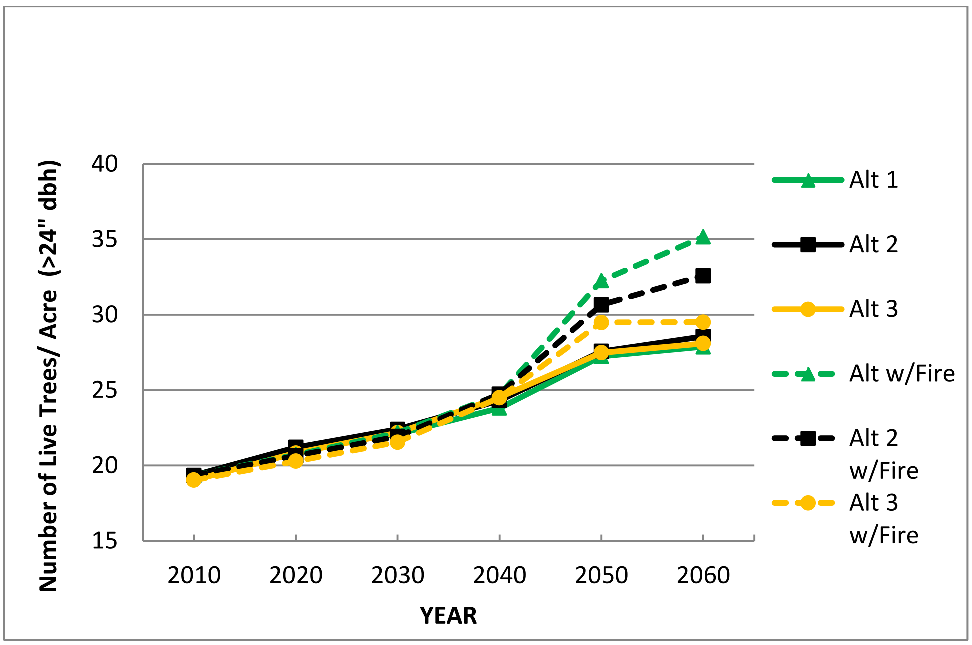


Figure 27: Weighted Average Live Tree Basal Area per Acre for Suitable CWHR Habitats for the California Spotted Owl and Goshawk by Alternative, and with Wildfire Modeled in the First Decade Reflected in 2020



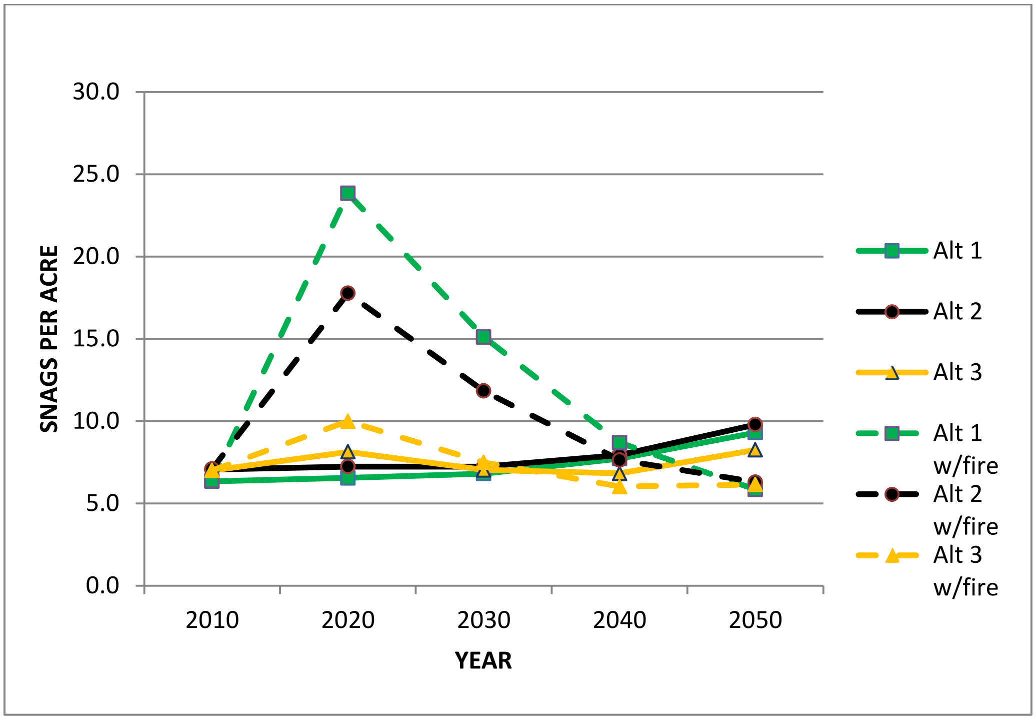
The number and distribution of medium to large live trees (24 inches or greater dbh) is anticipated to increase over the next 50 years given no treatment or wildfire. Existing values in 2010 were estimated at 19 trees per acre, increasing to approximately 21 trees per acre under normal growth and current stocking levels by 2020 (Figure 28). All wildfire scenerios for any Alternative show similar trend at 2020. However, a greater increase in the number of live trees greater than 24 inches dbh would emerge starting in 2040 depending on the alternative. The increased numbers are a result of fire-induced thinning which removes small trees and brush, providing a release of residual trees and recovery over time.

Figure 28: Weighted Average Number of Live Trees per Acre ≥24" dbh within all Modeled Vegetation types in the TRRP Project Area by Alternative, and with a Modeled Wildfire Reflected in 2020



Existing snag densities are expected to increase slightly in the first decade given no fuels reduction treatments. Weighted average snags per acre for all modeled vegetation types were estimated 6.3 snags per acre (snags 15" or greater dbh)(2010). By 2020 without treatment, snag values were estimated to increase to approximately 6.6 snags per acre (Figure 29). These values are within the range noted for mature stands (3-12 snags per acre). In contrast, under No Action with a wildfire and no prior fuels treatment, snag values are expected to dramatically increase to approximately 24 snags per acre (2020). Existing large woody debris was estimated by Jump (2004) at approximately 49.1 tons/acre. These values are expected to increase over time without fuels treatment.

Figure 29: Weighted Average Snags per Acre for All Modeled Types by Alternative, and with a Wildfire Modeled in the First Decade Reflected in 2020



Alternative 2: FVS modeling of suitable CWHR habitat types suggest that stands would show a slight decrease in both canopy cover and live tree basal area. Weighted average canopy closure would decrease by approximately two percent, reaching an estimated 63 percent in 2020. This value would still remain within the range acceptable for canopy cover at occupied spotted owl and northern goshawk nest sites (previously discussed in Alternative 1, Figure 26). The bulk of overhead canopy is contributed through existing dominant and co-dominant trees in the stand, which would not dramatically decrease through project implementation.

Live tree basal area would decrease from 326 sq.ft/acre to approximately 322 sq.ft./acre, and increase to approximately 334 sq.ft./acre by 2030, which are such minor changes they are nearly indistinguishable in Figure 27. These values would remain within the range noted within occupied nest/roost habitats (180-350 sq.ft./acre), and represent only a negligible decrease from Alternative 1 (No Action). Small tree thinning in some stands may increase currently limited flight space, providing a short term benefit for both species, facilitating more proficient prey capture.

When evaluating this alternative with a subsequent wildfire (2020), canopy cover is anticipated to decrease to approximatly 35 percent, with live tree basal area decreasing to an estimated 194 sq.ft/acre. Depending on the scale of any one fire event, decreased canopy cover may work to lower habitat quality (Figure 26), with values for live tree basal area lying just within the range noted for nest and roost habitats. These conditions on a large scale would result in a substantial departure from existing condition, but still above those anticipated under the No Action Alternative with wildfire.

Under Alternative 2, imminent hazard trees would be felled where a safety concern exists. However, FVS modeling predicts that the weighted average number of snags/acre for all modeled types would slightly increase to 7.2 snags per acre by 2020. This would be similar to that observed under the No Action Alternative which showed a value of 6.6 snags per acre for the same time frame. With implementation of this Alternative, it is anticipated that snag levels would be the lowest adajacent to roads and along ridgelines where shaded fuel breaks would be constructed or maintained. All felled snags would be left on site and piled and burned where large woody debris exceeds desired levels (10-20 tons/acre). Where large woody debris is lacking, felled snags would be retained on site and not burned. These guidelines for the retention of 10-20 tons/acre of large woody debris have been utilized for several decades in management of spotted owl and goshawk habitats in Region 5, and has been found to meet most life requisite needs for prey. Given that only 45 percent of the project area would be treated in this Alternative, higher amounts of large woody debris would remain, often exceeding 49 tons per acre. This would provide a mix of conditions across the landscape.

In Alternative 3 existing weighted average canopy cover values for suitable CWHR habitat types was estimated at 62 percent in 2010, increasing slightly to approximately 65 percent by 2020 (No Action, Alt. 1). With implementation of Alternative 3, FVS modeling predicts the canopy cover would decrease slighty to 61 percent by 2020, but would still remain within the range noted at occupied sites for the California spotted owl (60 to 95 percent) and northern goshawk (50 to 100 percent) (Figure 26).

Live tree basal area would also stay relatively consistent post treatment and out 50 years, given the size class of material moved. Existing weighted average live tree basal area in 2010 was estimated to be 311 sq.ft./acre, increasing slighty to approximately 326 sq.ft./acre by 2020 with no additional treatment. Under Alternative 3, FVS predicted a decrease to approximately 319 sq.ft./acre in 2020 (Figure 27). These values would remain within the range of variability for live tree basal area recorded at nest/roost sites (180-350 sq.ft./acre).

The overall distrbution of snags across the landscape is anticipated to remain relatively stable. Under Alternative 3, FVS predicted an estimated 8.1 snags per acre (2020) post implementation. This would be above that of the No Action Alternative which showed a value of 6.6 snags per acre for the same time frame. As previously discussed in Alternative 2, snag levels would be the lowest adjacent to roads and along ridgelines where shaded fuel breaks would be constructed or maintained. All felled snags would be left on site and piled and burned where large woody debris exceeds desired levels (10-20 tons/acre). Should large woody debris be lacking, felled snags would be retained on site and not burned. Burn operations would occur under controlled conditions. This would allow for retention of this resource across the project area, with pockets of higher concentratons expected within riparian zones, valley bottoms, and other moist micro-sites. This would provide diversity in terms of the amount and distribution of large woody debris across the landscape, meeting species and prey needs.

Metric 3. Acres treated and change in CWHR habitat score for spotted owl PACs/HRCAs and northern goshawk PACs/PFAs:

California spotted owl - California spotted owls in the Sierra Nevada have evolved in forests shaped by fire processes. It is clear that spotted owls occupy landscapes that experience low-to moderate-severity fire, as well as some level of mixed high severity wildfire. The degree to which varying fire severity levels and their scale influence owl territories, and long term survival, are currently not well understood.

Some research would indicate that high severity fire can be beneficial for spotted owls when it occurs on a small scale (smaller than 50 to 100-acre patches). For example Bond et al. (2009) evaluated several owl pairs (N=7) in a small section of the McNally Fire which had burned several years prior, and thus had experienced a level of recovery. Her results found owls nested and roosted in unburned or low-to moderate-severity patches of forest. Four years after the fire, they foraged selectively in high-severity burn areas that were located within their home ranges that had generally burned at low to moderate severity. However, Roberts and North (2012) cautioned in their review of this study that inferences from this "data was limited due to the small sample size and the non-random selection of study animals used."

Much of the most comprehensive work involving spotted owl response to fire landscapes suggests that fires of low to moderate severity have the least impact on continued site occupancy, and retain a greater subset of desirable stand features in remnant forests post fire (Keane et al. 2012, Roberts et al. 2011, North et al (2012). For example, the 2011 annual report of the Plumas Lassen study (PLS) released in June of 2012 investigated the response of spotted owls to various wildfires which occurred within their study area (Keane et al. 2012). This included the 2007 Moonlight-Antelope Complex Fire (MACFA) where approximately 52 percent of the fire burned at high intensity, and the 2008 Cub-Onion Fire (COCFA) in which only 11 percent burned at high intensity. PLS conducted California spotted owls surveys during the breeding period across the landscape for two consecutive years following the fires.

Prior to the MACFA there were 23 PACs located in the fire perimeter that had extensive baseline survey data. In the two years following the fire, surveys documented significant changes to the vegetation and amounts and distribution of California spotted owl habitat within the MACFA as a result of high severity wildfire. Results from this analysis suggested that the immediate post-fire landscape in this instance were likely not to support territorial California spotted owls. The majority of territorial spotted owls observed were located in the buffer area surrounding the fire perimeter. Their data noted that single male spotted owls detected across the burned landscape may have been present because of previous site fidelity or perhaps were opportunistically utilizing a flush of prey in the first year following the fire. Three detections of individual spotted owls just within the perimeter of the burn suggested that some owls were able to exploit the edge between the burned and unburned habitat for foraging. In contrast, the results for the COCFA landscape and distribution patterns suggested that spotted owls were able to persist in the post-fire landscape of low -moderate severity wildfire with similar abundance and spacing as had been observed in unburned forest outside the burned areas (Keane et al. 2012).

Roberts et al. (2011) looked at spotted owl site occupancy in burned and un-burned sites within Yosemite National Park and found density estimates of California spotted owl pairs were similar in both. They found that low to moderate severity fires, which were historically common within Sierra Nevada forests, maintained important habitat characteristics for spotted owl site occupancy. Where managers allowed low- to moderate-severity fire to periodically clear out thickets of small trees and leave behind large live trees while retaining high overstory canopy closure, it did not negatively affect owl occupancy. Their results suggest that "…managed fires that emulate the historic fire regime of these forests may maintain spotted owl habitat and protect this species from the effects of future catastrophic fires" (Roberts et al. 2011).

North et al. (2012, Chapter 5) summarized results from Clark (2007 and 2011) which studied spotted owls in post fire landscapes of the southern Cascades. This work suggested that northern spotted owl occupancy and annual survival rates declined, and annual home range and local extinction increased immediately following (1-4 years) wildfire. Clark (2007) also noted that annual home range size increased with increasing amounts of hard edge suggesting lower quality habitat due to fragmented sites. Clark (2011) however cautioned readers that the results of his study may not be applicable to other fire-prone landscapes because the majority of the sample came from the Timbered Rock Burn, which was dominated by checker board pattern of private and federally administered lands. Both contained a history of prior logging and post-fire salvage logging which decreased overall amounts of remaining suitable habitat. Therefore, these conditions undoubtedly exacerbated or confounded their ability to assess the effects of wildfire on survival rates in this study. Clark (2007) did observe that while spotted owls were found to use burned habitat of all fire severity, owls strongly select areas with low-severity or unburned habitat with minimal overstory canopy mortality following a wildfire.

No Action: The implications of the above body of research in terms of the TRRP project would suggest that a wildfire without prior fuels treatment may substantially decrease habitat suitability through losses in structural complexity and canopy cover (see discussion for No Action, Metric 2). Under the No Action Alternative, none of the PACs/HRCAs would be treated. Existing CWHR scores as modeled would remain the same, or slightly increase over time without fire (No Action and No Wildfire, 2020). In contrast, under No Action with a modeled wildfire (2020) most CWHR scores for PACs and associated HRCAs are estimated to decrease by half or more as shown (Table 54). Based on wildfire modeling outcomes without prior fuels treatment, there is an increased likelihood for both active and passive crown fire to occur over 85 percent to of the project area, resulting in moderate to high severity fire. This condition would have a higher likelihood of greater structural losses in valuable habitat components as reflected in the changed CWHR scored values (Table 54, No Action with Modeled Wildfire 2020).

Table 54: Calculated CWHR Scores for California Spotted Owl PACs and HRCAs by Alternative, with and without wildfire in the first decade (PACs and HRCAs include all vegetation types and associated scores).

		ALTERNATIVE 1			ALTERNATIVE 2		ALTERNATIVE 3	
OWL ID #		Existing Condition 2010	No Action or Wildfire 2020	No Action with Modeled Wildfire 2020	Treatment without Wildfire 2020	Treatment with Modeled Wildfire 2020	Treatment without Modeled Wildfire 2020	Treatment with Modeled Wildfire 2020
TUL0028[a]	PAC	0.953	0.953	0.747	0.953	0.747	0.953	0.747
	HRCA[b]	0.813	0.813	0.629	0.813	0.629	0.813	0.629
TUL0201	PAC	0.762	0.857	0.377	0.849	0.416	0.849	0.416
	HRCA	0.653	0.812	0.302	0.784	0.347	0.804	0.391
TUL0173	PAC	0.543	0.667	0.079	0.652	0.094	0.652	0.094
	HRCA	0.688	0.760	0.140	0.748	0.261	0.748	0.452
TUL012	PAC	0.849	0.946	0.495	0.944	0.505	0.944	0.505
	HRCA	0.849	0.936	0.395	0.902	0.461	0.931	0.630
TUL013	PAC	0.677	0.742	0.390	0.854	0.426	0.854	0.426
	HRCA	0.625	0.731	0.368	0.789	0.392	0.782	0.400

[a] TUL0028 has no change because it is adjacent to, but not in the TRRP treatment areas.
[b] HRCA acres include acres encompassed by the PAC and an additional 300 acres. Scored values include all CWHR habitat types, sizes and densities present, not just suitable habitat.

Alternative 2 : Under Alternative 2, portions of four PACs/HRCAs would be treated to establish shaded fuel breaks along Forest Roads 21S94 and 21S12, along ridgelines and around private property. PAC and HRCA acres treated by ID number are displayed in Table 55 by alternative. For Alternative 2, this includes an estimated 163 acres of suitable habitat within PACs (ranging from 0 to 63 acres), and an estimated 127 acres of suitable habitat outside of PACs but within the larger HRCA boundary (range 0 to 54 acres). Fuels reduction work in PACs would follow provisions as stated in the Monument Plan, which would provide protection of existing nest sites, use limited thinning of small trees (less than 6 inches in diameter), and use of prescribed fire. Outside of the PACs but within the remainder of the HRCA, thinning would be limited to the thinning of small trees (12 inches dbh or less) and brush. Generated material from fuel reduction work would be piled and burned.

Table 55: Acres of California Spotted Owl PACs and HRCAs Treated by Alternative

	Alternative 2		Alternative 3	
PAC/HRCA ID #	**PAC**	**HRCA**	**PAC**	**HRCA**
TUL0028	0	0	0	0
TUL0201	44	54	143	141
TUL0173	26	34	40	257
TUL0012	30	20	76	230
TUL0013	63	19	267	56
Total Acres	**163**	**127**	**526**	**684**

Spotted owls select habitat at multiple spatial and temporal scales, with less flexibility in nesting and roosting habitat requirements than foraging habitat. Studies seem to agree that maintaing both high overstory canopy cover and abundance of large live trees are major predictors of habitat suitability, and hence their selection by the California spotted owl

Table 54 displays existing PAC and HRCA[8] CWHR habitat scores for spotted owl sites, and those anticipated post treatment as reflected in 2020 by Alternative. Alternative 1 reflects the existing condition score calculated (2010) and as modeled with FVS to reflect normal growth over the first decade (2020). For example, existing baseline CWHR score for TUL0201 PAC in 2010 was 0.762. This value increased only slightly by 2020 to 0.857 given current stand density. In contrast, thin and burn operations under Alternative 2 implemented and reflected in 2020, would result in a slight decrease in overall CWHR score from 0.857 to 0.849, or a 0.008 difference. This pattern of small incremental decreases under Alternative 2 are noted with all CWHR scores for three of the PACs (range from 0.002 to 0.015) and HRCAs (range from 0.012 to 0.034). Two of the PACs would stay the same or increase in CWHR score. This includes TUL013 whose PAC and HRCA scores slighly increase post treatment from 0.742 to 0.854, and from 0.731 to 0.789 respectively, and TUL0028 which lies outside the project area resulting in no change in score for either PAC or HRCA. These modest alterations in scores suggest little significant change in habitat availability or suitability, given the acres treated within any one PAC/HRCA. Discussions under Metric 2 also show little appreciative change in canopy cover, live tree basal area, availability of large live trees,

[8] HRCA scores in this instance reflect the entire HRCA. This includes the PAC (300 acres) portion of the HRCA and the remaining area outside the PAC but within the HRCA. Scores include all CWHR habitat types, sizes, and densities, not just suitable habitat.

and snags. Some modification would occur with the amount and distribution of large woody debris, however, adequate levels would be retained (10 to 20 tons/acre). Use of prescribed fire methods when conducting burning is anticipated to further minimize effects on important habitat attributes. Implementation of designated limited operating periods would eliminate disturbance related effects during the critical stage of the nesting period.

When comparing the PAC and HRCA scores post treatment with a subsequent wildfire modeled under summer conditions reflected in 2020 as shown in Table 53, all values show marginal incremental increases in CWHR score with either Action Alternative over those noted with Alternative 1 and Wildfire.

Alternative 3: Under Alternative 3 an estimated 526 acres of suitable habitat within PACs (range 0 to 267 acres), and an estimated 684 acres of suitable habitat outside of PACs but within the larger HRCA boundary (range 0 to 257 acres) would be treated. CWHR scores for three PACs (TUL0201, TUL0173, TUL0012) show a slight decrease ranging from 0.002 to 0.015 depending on the PAC, with the portion of the HRCA outside of the PAC expected to decrease from 0.005 to 0.012 depending on the HRCA.   Two of the PAC/HRCAs would show either a slight increase or remain the same. This includes TUL013 whose CWHR scores for the PAC and HRCA would increase post treatment by 0.112 and 0.050 respectively, and TUL0028 where no change occurs. These modest alterations in scores are not anticipated to result in significant changes in habitat availability or suitability, as previously discussed in Metric 2 (this section). Pile and burn and understory burning would occur under prescribed conditions to limit impacts to forest stands and loss of valuable habitat attributes. Use of appropriate limited operating periods as stated in the Monument Plan, would limit disturbances during critical time frames in the nesting cycle.

When evaluating the effects from a wildfire following treatment, CWHR scored values for PACs/HRCAs would remain highest with a selection of Alternative 3, followed by Alternative 2, and then Alternative 1.

Northern Goshawk – No Action Alternative: Under the No Action Alternative, none of the goshawk PACs/PFAs would be treated. As with the California spotted owl, existing CWHR scores would slightly increase without treatment or modeled wildfire (Table 56). All CWHR scores decreased in scored value based on FVS modeling with a wildfire over the same time period, reflected in 2020. The anticipated effects from wildfire would be similar to that discussed previously for the California spotted owl.

Table 56: Estimated CWHR Scores for Goshawk PACs and Estimated PFAs for Alternative 1 in 2010, and with and without Wildfire in the first Decade

GOSHAWK SITE ID		ALTERNATIVE 1 (NO ACTION)			ALTERNATIVE 2		ALTERNATIVE 3	
		Existing Condition 2010	No Action or Wildfire 2020	No Action with Modeled Wildfire 2020	Treatment without Wildfire 2020	Treatment with Modeled Wildfire 2020	Treatment without Modeled Wildfire 2020	Treatment with Modeled Wildfire 2020
Long Canyon	PAC	1.00	1.00	0.848	1.00	0.848	1.00	0.848
	PFA	0.984	0.985	0.685	0.985	0.743	0.985	0.751
West	PAC	0.892	0.892	0.296	0.892	0.296	0.892	0.296

GOSHAWK SITE ID		ALTERNATIVE 1 (NO ACTION)			ALTERNATIVE 2		ALTERNATIVE 3	
		Existing Condition 2010	No Action or Wildfire 2020	No Action with Modeled Wildfire 2020	Treatment without Wildfire 2020	Treatment with Modeled Wildfire 2020	Treatment without Modeled Wildfire 2020	Treatment with Modeled Wildfire 2020
Wilson	PFA	0.814	0.818	0.338	0.817	0.364	0.816	0.466
Roger's Camp	PAC	0.961	0.988	0.613	0.988	0.613	0.988	0.613
	PFA	0.956	0.966	0.545	0.967	0.573	0.995	0.656

Alternatives 2 and 3: Under Alternatives 2 and 3, none of the goshawk PACs would be treated and therefore calculated CWHR scores remain relatively the same. Table 57 displays the estimated acres within each PFA treated by alternative which vary by location. Thinning and fuels reduction work as modeled for the PFAs shows negligible changes in CWHR Scores for 2020 values under either action alternative. In Alternative 2, the West Wilson PFA would decrease by 0.001, the Rogers Camp PFA would increase by 0.001, and the Long Canyon PFA CWHR score would not change (Table 56).

Table 57: PAC and PFA Acres Treated by Alternative

	Alternative 2		Alternative 3	
PAC/PFA	PAC	PFA Treated Acres	PAC	PFA Treated Acres
Long Canyon	0	46	0	67
West Wilson	0	88	0	152
Rogers Camp	0	42	0	87
Total Acres	0	176	0	306

Under Alternative 3 total PFA acres treated would be 306, the range for any individual PFA is 67 to 152 acres. Under Alternative 3, the West Wilson PFA would decrease by 0.002, the Rogers Camp PFA would increase by 0.029, and the Long Canyon PFA CWHR score would not change (Table 56).

In comparing each alternative with and without treatment and a subsequent wildfire event (2020), CWHR scores would be slightly lower with Alternative 1 (No Action), and higher PFA scores with Alternative 3.

Fisher:

Metric 1. Acres treated and change in project area CWHR score for fisher 2.1 habitat types:

Alternative 1 - There is approximately 2,295 acres of CWHR 2.1 fisher habitat within the TRRP Project area. Calculated CWHR scores were generated for this habitat as shown in Table 58 by Alternative. Under Alternative 1, the amount and distribution would not be altered, since no treatment would occur. The score for CWHR 2.1 habitat in 2010 was estimated at 0.662, with a slight increase expected over the first decade at 0.740 by 2020. Without any prior fuels reduction work and a subsequent wildfire reflected in 2020, the CWHR habitat score is predicted to decrease to 0.205 based on existing stand conditions and 90th percentile weather conditions.

Table 58: Calculated CWHR 2.1 Scores for Fisher Habitat by Alternative

Alternative 1			Alternative 2		Alternative 3	
Existing Condition 2010	No treatment or Wildfire 2020	No treatment with Wildfire 2020	Treatment with No Wildfire 2020	Treatment with Wildfire 2020	Treatment with No Wildfire 2020	Treatment with Wildfire 2020
0.662	0.740	0.205	0.681	0.392	0.680	0.597

* Scores include all CWHR habitat types, sizes, and densities classes, not just suitable habitat.

Alternative 2 - Alternative 2 would treat approximatley 1,055 acres or 46 percent of the suitable fisher habitat. This acreage includes approximately 502 acres in shaded fuel breaks, 263 acres within the understory burn, 124 acres in owl or goshawk PACs, and 165 acres in planted stands. A portion of the fisher den buffer (80 acres) overlaps acres identified for shaded fuelbreak treatment. In this instance, standards and guidelines as stated in the Monument Plan would apply (see Metric 3 on Den Buffer for discussion). With implementation of Alternative 2, the overall scores for CWHR 2.1 habitat would decrease from 0.740 (Alt. 1 - 2020) to an estimated 0.681, or a decrease of 0.059 (Table 58). Based on discussion regarding desirable stand characterisitcs for the fisher, habitat quality would not change significantly (See discussion under Metric 2) allowing for continued occupancy and movement.

Alternative 3 - Alternative 3 would treat approximatley 2,280 acres (99 percent) of the suitable habitat in the project area. This acreage includes 464 acres in shaded fuel breaks, 221 acres within the understory burn, 478 acres in owl or goshawk PACs, 165 acres in planted stands, and 952 acres in other fuels treatment. A portion of the fisher den buffer (80 acres) overlaps acres identified for shaded fuelbreak treatment with an additional 45 acres overlapping with areas identified as other fuels treatment. Standards and guidelines as stated in the Monument Plan for den buffers would take priority and be applied in this instance (see Metric 3 on Den Buffer for discussion). With implementation of Alternative 3, the overall scores for CWHR 2.1 habitat would decrease from 0.740 (Alt. 1 - 2020) to an estimted 0.680, or a decrease of 0.060.

When contrasting Alternatives 2 or 3 with subsequent wildfire modeled under summer conditions, CWHR 2.1 habitat scores would be maintained at the highest level with a selection of Alternative 3 at 0.597, followed by Alternative 2 at 0.392, and lowest for the No Action Alternative at 0.205. The potential for passive and active crown fire and its rate of spread is predicted to be lowest with a selection of Alternative 3, followed by Alternative 2 and then Alternative 1.

Metric 2. Change of desirable stand characteristics which are most at risk and difficult to replace in suitable CWHR 2.1 types:

Change in dense canopy cover, live tree basal area, large live trees, snags, and down woody debris:

Alternative 1 - The presence and distribution of CWHR 2.1 suitable habitats with higher canopy cover and live tree basal area are anticipated to remain relatively static with a selection of Alternative 1. Weighted average canopy cover for CWHR 2.1 habitat types were estimated at 66 percent in 2010, and increase slightly over the first decade to approximately 69 percent by 2020 (Figure 30). These canopy cover values are within the range of variability noted in scientific literature for den and rest sites. Average canopy cover measured at documented natal and maternal dens from the Kings River Study, as of 2009, was 74.3 percent, (SD=12.4, range 47.5 percent - 99.0 percent, n = 51). In comparing canopy cover values expected for suitable CWHR 2.1 habitat under No Action with Wildfire as reflected in 2020, canopy cover was estimated to decrease to approximately 21 percent (Figure 30). These conditions would substantially lower habitat quality depending on the scale of any one event.

Existing weighted average live tree basal area for CWHR 2.1 habitat types were estimated in 2010 at approximately 311 sq. ft./acre, and are anticipated to increase slightly to approximately 330 sq. ft./acre by 2020 (Figure 31). This would be within the range noted for natal and maternal den sites in the upper Tule River Basin which included values from 101 to 500 sq. ft./acre, with a mean 243 sq. ft./acre (derived from Truex et al 1998). With No Action and Wildfire (2020), weighted average live tree basal area would also decrease substantially to approximately 111 sq. ft./acre (Figure 31) which would be at the very low end of the range noted.

Research suggests that an adequate availability and distribution of large live trees are needed for rest and den sites. These features are also infrequently reused by fisher which heightens the need for broad scale distribution (Zielinski et al. 2004b). Therefore retaining as many large and intermediate trees (24” dbh or greater) across the landscape as possible is an appropriate conservation measure to provide for long term habitat quality and stability for the fisher. It was previously estimated that approximately 17 live trees in this size class or greater would be necessary to retain habitat options across the project area. Figure 32 displays the existing condition and those anticipated to change with implementation of Alternatives 1 through 3.

Under Alternative 1, the number and distribution of medium to large live trees is anticipated to slowly increase over the next 50 years. FVS values noted in 2010 were estimated at 19 trees per acre, increasing to approximately 21 trees per acre given normal growth at current stocking levels by 2020 (Figure 32). Under No Action with a modeled wildfire (2020), the trend line is similar to that of No Action without wildfire, but then strongly increases starting in 2040. This increase represents growth of remnant trees not consumed by the fire, given decreased competition and lower overall stand density.

Alternative 2 - Implementation of Alternative 2 is not anticipated to substantially alter the quality or distribution of CWHR 2.1 habitat for fisher in the project area. Existing canopy cover and live tree basal area would slightly decrease but values would remain within the range in occupied habitats. FVS modeling predicts that the weighted average canopy cover would drop to approximately 61 percent post implemenation (2020), but increase to approximately 63 percent by 2030. The bulk of overhead canopy contributed by existing dominant and co-dominant trees in the stand would not be altered. While lower than the values observed with No Acton, canopy cover would remain within the range of variability noted in occupied den habitats (canopy cover range 47.5 percent - 99.0 percent). This alternative would only treat approximately 45 percent of the available 2.1 CWHR fisher habitat available in the project area. Therefore untreated stands exhibiting dense canopy cover (exceeding 61 percent) would continue to exist randomly across the landscape (Figure 31).

FVS modeling predicted that live tree basal area would decrease under Alternative 2 in treated locations. Comparisons between 2020 values show that basal area would decrease from 330 sq.ft./acre (Alt. 1) to 309 sq.ft./acre with implementation of Alternative 2. Despite this decrease, predicted values will remain in the range of variability noted for maternal and natal dens found in the upper Tule River basin (Figure 32).

Under Alternatives 2 or 3, FVS predicts that the number of medium to large live trees and their distribution would remain at relatively the same trajectory to that of No Action over the first several decades, since large live trees would not be felled (Figure 32). Thinning guidelines for this project also favor the retentions of tree species, and size classes, most important to the fisher. Only small trees (12” dbh or less) would be thinned to reduce ladder fuels but still retain a mix of this size class spaced throughout the understory. Focus will be placed on retaining young giant sequoia, pine and black oak when present over incense cedar and white fir. These guidelines in conjunction with proposed burning techniques will allow for the retention of both low ground cover and more hardened physical structures such as large down logs.

Snag density is anticipated to slightly increase with this alternative in comparison to that of the No Action Alternative (see Figure 29, and the previous discussion on snag resources for Alternative 2 in the spotted owl and goshawk section, pages 155-156). Snags would be felled if deemed an imminent safety hazard, but otherwise would be retained. With Alternative 2 these removals would generally be confined to road prisms, ridgetops and private property interfaces. The majority of snags within the larger project area would be left, maintaining these desirable attributes across the landscape.

Figure 30: Weighted Average Percent Canopy Cover for CWHR 2.1 Fisher Habitat in the TRRP Project Area by Alternative, and with a Modeled Wildfire in the first decade reflected in 2020

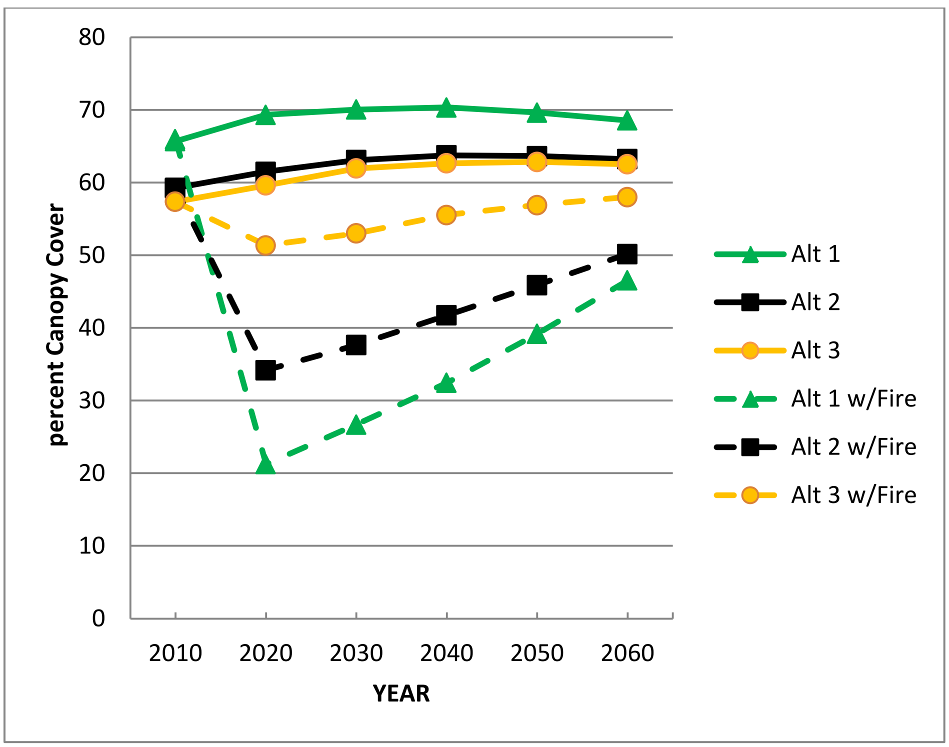


Figure 31: Weighted Average Live Tree Basal Area (sq.ft./acre) for CWHR 2.1 Types in the TRRP Project Area by Alternative, with a Wildfire Modeled in the First Decade and Reflected in 2020

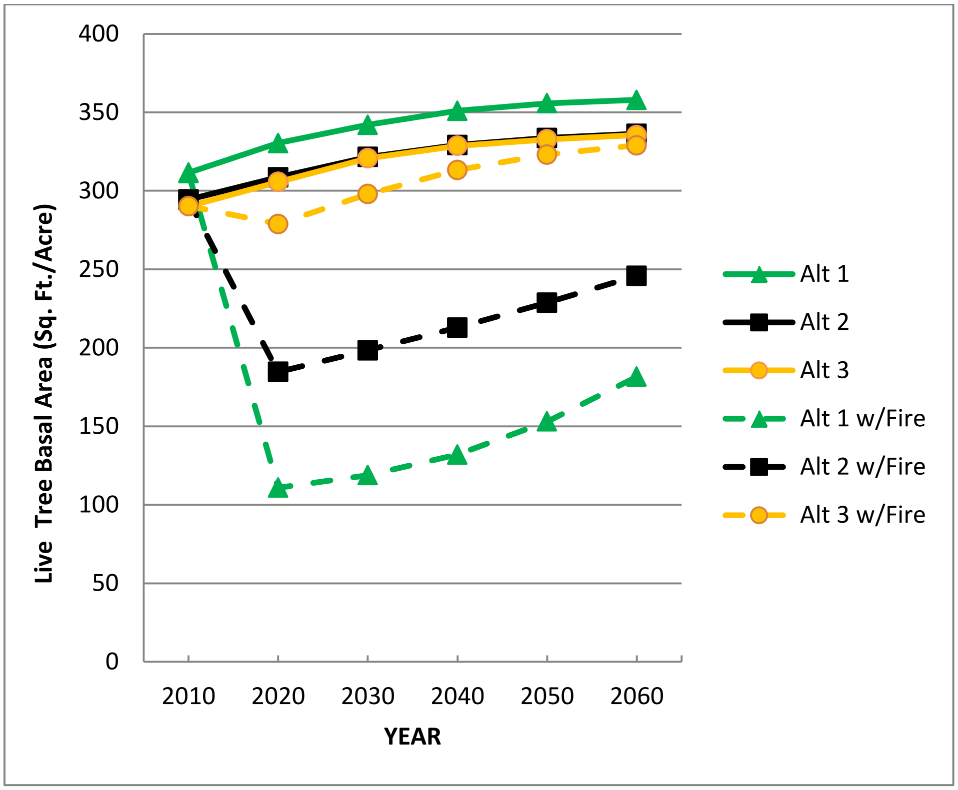
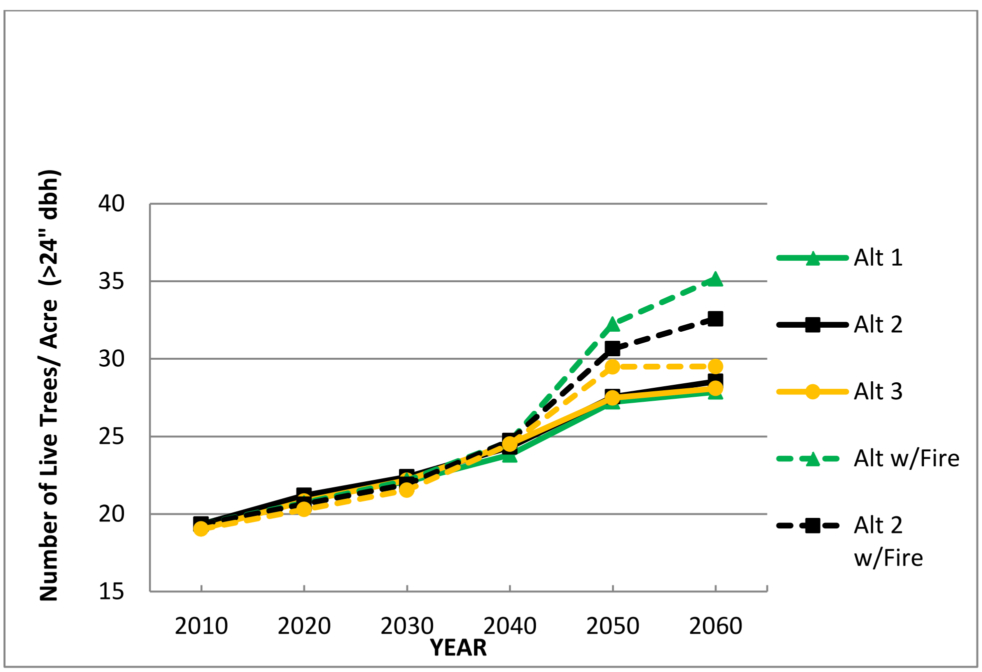


Figure 32: Weighted Average Number of Live Trees Per Acre >24" dbh within all Modeled Vegetation types in the TRRP Project Area by Alternative With and Without Fire



Fuel reduction prescriptions will retain between 10-20 tons/acre of large woody debris where implemented. Under Alternative 2 thinning of small trees and brush would be completed by hand, with the majority of activity fuels piled and burned. This methodology gives resource professionals increased flexibility to retain large trees and down logs utilized by the fisher. Given that 45 percent of the project area would not be treated, adequate levels of woody debris will be available for hiding cover and for prey species. Non treated portions of the project area would maintain large woody debris levels well over 49 tons per acre.

Alternative 3 - Alternative 3 treats the majority of the CWHR 2.1 habitat in the project area through small tree thinning and other prescribed fuels treatment. As with Alternative 2, thinning would be limited to small trees less than or equal to 12 inches dbh. Conditions expected post implementation are similar to those noted with Alternative 2 and therefore are not anticipated to dramatically impact habitat quality or its distribution. Not all small trees (12 inches or less) would be felled with fuels reduction work. Those left on site are to have good form and potential for growth, with a focus placed on retaining giant sequoia, pine and black oak, over fir and cedar. Thinning small trees, while leaving large and moderate trees in the overstory, results in stand conditions with a diversity of canopy layers. In planted stands where more small trees are present, thinning would likely lead to accelerated growth and better canopy development. Over time this would increase the recruitment and development of larger trees over 12 inches dbh, providing a long-term benefit for the fisher. Scattered complexes of brush would also be retained in areas treated. It is anticipated that adequate cover would be maintained to enable future travel, foraging, or den activities.

Under Alternative 3, FVS predicts that weighted average canopy cover for CWHR 2.1 habitats would be approximately 60 percent post treatment, leveling to 62 percent by 2030. These values while lower than those noted in the No Action Alternative or with Alternative 2, would remain within the range of variability noted at occupied den sites (range 47.5 percent to 99.0 percent) (Figure 30). Based on FVS modeling, live tree basal area would slightly decrease with implementation of Alternative 3, but would still lie within the range of variability noted at maternal and natal dens found within the upper Tule River basin at approximately 306 sq.ft /acre (Figure 31, 2020). This is only slightly lower than values expected under the No Action Alternative without wildfire for the same period (2020).

In contrast, weighted average canopy cover post implementation followed by a wildfire (2020) is anticipated to decrease the least with Altenative 3 at 51 percent. This is followed by Alternative 2 at 34 percent, and last by the No Action Alternative at 21 percent. Fuels reduction work accomplished in Alternative 3 is also anticipated to allow for greater retention of existing basal area under a wildfire in comparison to the other alternatives. FVS predicts basal area would be retained at 279 sq.ft./acre with Alternative 3, followed by Alternative 2 at 185 sq.ft./acre, and the lowest under Alternative 1 at 111 sq.ft./acre.

As with Alternative 2, the availability of medium to large live trees would follow a similar trend as No Action since none would be removed. With a modeled wildfire (2020), and prior fuel treatments, the trend line remains similar to that of No Action, but then increases only modestly in comparison to the other alternative due to lower levels of mortality.

Changes in snag density and large woody debris would be the same as discussed previously as shown in Figure 30, under the spotted owl and goshawk section for Alternative 1. The intent of the project is not to fell all existing snags but to only fell imminent hazards where needed. Project design features also require retention of large woody debris (10-20 tons/acre). Throughout the broader forested landscape, snag and large downed woody debris levels have generally increased, due to normal drought/pest cycles, lack of natural fire processes, and fewer activities to remove them. Under Alternative 2, thinning small trees and brush would be completed by hand with the majority of activity fuels piled and burned. This methodology gives resource professional's increased flexibility to retain legacy elements utilized by the fisher. The overall distribution of snags across the landscape is anticipated to remain relatively stable with a slight increase reflected with a selection of Alternative 3 at an estimated 8.1 snags per acre (2020) with similar effects as discussed under the spotted owl and northern goshawk section for this attribute (see Figure 29 and discussion on pages 155-156).

Metric 3. Acres treated and change in CWHR score for fisher den buffer.

No Action - Under the No Action Alternative the den buffer would not be treated. Table 59 displays the existing CWHR scores for the fisher den buffer in 2010, and those anticipated in 2020 with and without a wildfire. Existing condition CWHR score calculated in 2010 was 0.721; this value is expected to slightly increase over the first decade to 0.755. Under No Action with a wildfire reflected in 2020, the CWHR score is anticipated to decrease to 0.346, suggesting lower habitat suitability for the den buffer (Table 59).

Table 59: Fisher Den Buffer CWHR Scores [a] by Alternative with and without a modeled wildfire

	Alternative 1 (No Action)			Alternative 2		Alternative 3	
Percent Den Buffer Overlap w/TRPP Project Area	Existing Condition 2010	No Action or Wildfire 2020	No Action with Wildfire 2020	Treatment without Wildfire 2020	Treatment with Wildfire 2020	Treatment without Wildfire 2020	Treatment with Wildfire 2020
21 percent	0.721	0.755	0.346	0.750	0.557	0.750	0.613

[a] Scores include all CWHR habitat types, sizes, and densities, not just suitable habitat.

Alternatives 2 & 3 - Under Alternative 2, an estimated 80 acres would receive minimal fuels treatment using standards and guidelines in the Monument Plan. Under Alternative 3, an estimated 125 acres would receive minimal fuels treatment using standards and guidelines in the Monument Plan (USDA, 2012a, pg. 91).

Calculated CWHR scores for the fisher den buffer in Alternatives 2 or 3 shows a decrease of only 0.005. Based on a modeled wildfire 2020, it is anticipated that CWHR scores would be lowest for Alternative 1 with wildfire at 0.346, slightly higher under Alternative 2 with a wildfire at 0.557, and remain the highest with a selection of Alternative 3 with wildfire at 0.613. The actual maternal den site located through radio telemetry occurred downslope and outside of the TRRP project area and therefore would not be modified by project actions.

Marten:

Metric 1. Acres treated and change in project area CWHR score for suitable marten habitat types:

Alternative 1: Estimated CWHR scores generated for suitable marten habitat in the TRRP project area are shown in Table 60 by Alternative. Under Alternative 1, existing acres (2,060 acres) would remain in its current distribution. The CWHR 2.1 habitat score in 2010 was estimated at 0.544, increasing slighty over the first decade to approximately 0.570 by 2020. Without prior treatment and a wildfire, the CWHR habitat score is anticipated to decrease to 0.227 (2020) based on existing stand conditions. These scores reflect the vegetation types present and changes in desirable stand features (canopy cover, basal area, snags, etc.) discussed under Metric 2 below.

Table 60: Calculated CWHR Scores for suitable Marten Habitat by Alternative

Alternative 1			Alternative 2		Alternative 3	
CWHR Score - Existing Condition 2010	CWHR Score - No treatment or Wildfire 2020	CWHR Score - No treatment with Wildfire 2020	CWHR Score - Treatment with No Wildfire 2020	CWHR Score - Treatment with Wildfire 2020	CWHR Score - Treatment with No Wildfire 2020	CWHR Score - Treatment with Wildfire 2020
0.544	0.570	0.227	0.548	0.378	0.549	0.548

Scores include all CWHR habitat types, sizes, and densities, not just suitable habitat.

Alternative 2 would treat approximately 947 acres, or 46 percent of the suitable habitat. This acreage includes approximately 459 acres in shaded fuel breaks, 261 acres within the understory burn, 119 acres in owl and goshawk PACs, and 108 acres in planted stands. With implementation of Alternative 2 the overall CWHR scores would decrease from 0.570 to 0.548 or a 0.022 difference.

Alternative 3 would treat approximately 2,245 acres (99 percent) of the suitable habitat. This acreage includes 423 acres in shaded fuel breaks, 217 acres within the understory burn, 450 acres in owl and goshawk PACs, 108 acres in planted stands, and 847 acres in other fuels treatment. With implementation of Alternative 3, the overall CWHR scores for suitable habitat would decrease from 0.570 to 0.549, or 0.021 difference.

When contrasting each alternative with subsequent wildfire under summer conditions (2020), CWHR scores would be highest with a selection of Alternative 3 at 0.548, followed by Alternative 2 at 0.378, and lowest for the No Action Alternative at 0.227.

Metric 2. Change of desirable stand characteristics which are most at risk and difficult to replace in suitable marten habitat types.

Change in dense canopy cover:

Alternative 1 - With a selection of this alternative, habitat condition and its distribution would not be altered. Existing weighted average canopy cover was estimated based on FVS runs at 61 percent in 2010, increasing slightly to approximately 64 percent in 2020 (Figure 33). Weighted average live tree basal area in 2010 was estimated at 317 sq.ft./acre, increasing to 333 sq.ft./acre by 2020. All of these values fall within the range noted at occupied sites (canopy cover 40 to 100 percent, basal area 163-350 sq.ft./acre) (USDA 2001).

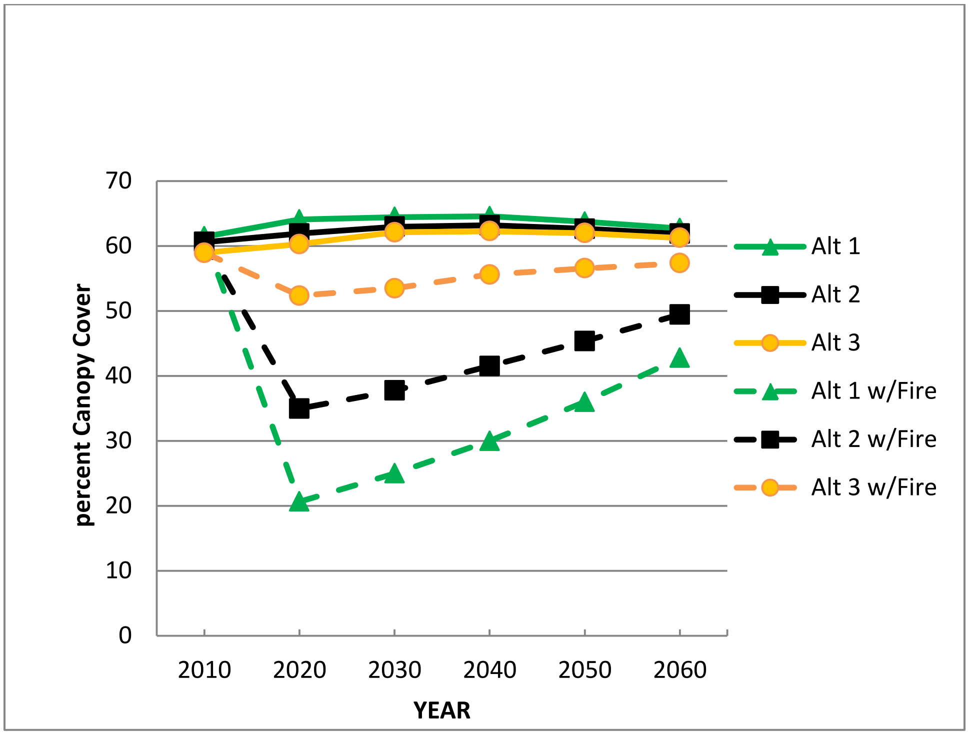
FVS modeling of habitat without any prior fuels treatment and a wildfire indicate it would be severely affected. Canopy cover would be expected to drop to 21 percent (Figure 33) while live tree basal area is predicted to drop to an estimated 121 sq.ft./acre (Figure 34). Both of these values would fall below ranges previously identified for marten.

Existing density of large live conifers within all modeled types currently exceeds recommended values for marten of 6 trees per acre 24 inches dbh or greater, suggesting adequate availability (see Figure 33). Without any prior treatment and a wildfire, the trend line stays gradual for the first several decades and then increases starting in 2040.

Existing snag densities are expected to increase slightly in the first decade given no fuels reduction treatments. Weighted average snags per acre for all modeled vegetation types were estimated

6.3 snags per acre (snags ≥ 15 inches dbh)(2010). By 2020, snag levels are estimated to increase to approximately 6.6 snags per acre (Figure 30). These values are within the range noted for mature stands (3-12 snags per acre) and those recommend for suitable marten habitat. In contrast, under No Action with a wildfire and no prior fuels treatment, snag values are expected to dramatically increase to approximately 24 snags per acre (2020).

Figure 33: Weighted Average Percent Canopy Cover for Suitable CWHR Habitats for Marten in the TRRP Project Area by Alternative, and with Wildfire Modeled in the First Decade as Reflected in 2020



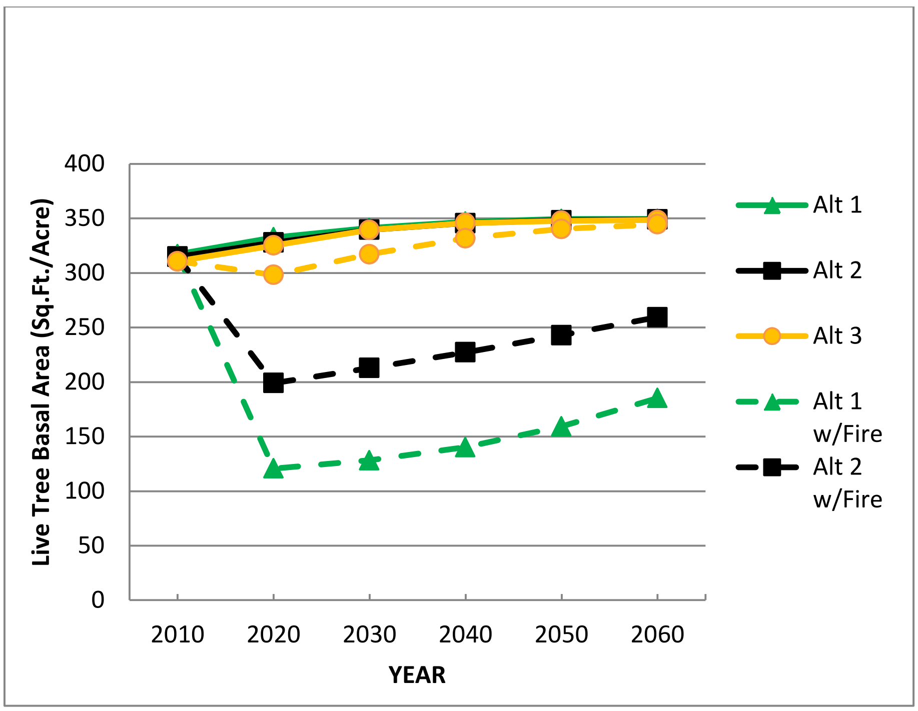
Alternative 2 – Marten habitat quality and its distribution would not substantially shift with implementation of Alternative 2. Weighted average canopy cover is anticipated to decrease slightly to 62 percent in 2020 and return to 63 percent by 2030 (Figure 33). Weighted average live tree basal area would decrease to approximately 328 sq.ft./acre, and increase to approximately 339 sq.ft./acre by 2030. All of these values fall within the range of variability noted in occupied habitats for canopy cover (40 to 100 percent) and live tree basal area (greater than 163 sq.ft./acre) as referenced by the SNFPA (USDA 2001). With a wildfire modeled following treatment reflected in 2020, weighted average canopy cover for suitable habitat types is predicted to drop to 35 percent, slightly above those noted with Alternative 1. However this value would still be below the desired range of 40 percent to 100 percent, while live tree basal area would fall to approximately 199 sq.ft./acre (Figure 34).

Existing density of large live conifers within all modeled types currently exceeds recommended values for marten of 6 trees per acre 24 inches greater suggesting adequate availability (see Figure 34). Effects of implementing Alternative 2 or 3 would not change the weighted average number of live trees present in modeled types within the project area since they are not being removed. Values follow a similar trend trajectory to that noted under Alternative 1 and fall within the range needed for den and rest activities as previously referenced.

Under Alternative 2, imminent hazard trees would be felled where a safety concern exists. FVS modeling predicts that the weighted average for all modeled types would slightly increase to 7.2 snags per acre by 2020, with snags greater than 24 inches dbh at 3.5 snags per acre. Therefore, these elements would be adequate to retain habitat and structure in a suitable condition. When implementing Alternative 2 followed by a wildfire, FVS predicts a relatively strong increase in snag levels at 18 snags per acre.

Project design features would retain large woody debris (10-20 tons/acre) in the largest size classes available in fuel reduction areas. However, a little less than half of the project area would receive no fuels treatment leaving large downed woody debris at existing levels (49 tons/acre). Fuels concentrations would continue to accumulate under normal drought/pest cycles resulting in higher burn intensity in any wildfire event.

Figure 34: Weighted Average Live Tree Basal Area (sq. ft. /acre) for Suitable CWHR Types for Marten in the TRRP Project Area by Alternative, and with a Wildfire Modeled in the First Decades as Reflected in 2020.



Alternative 3 – Habitat quality and its distribution would not substantially shift with implementation of Alternative 3. Similar trends with regard to canopy cover and basal area would be realized. Weighted average canopy cover is anticipated to decrease to approximately 60 percent (2020) (Figure 33), with live tree basal area decreasing to approximately 325 sq.ft /acre, which are such minor changes they are nearly indistinguishable in Figure 34. All these values would fall within the range noted for these attributes in occupied habtats.

Under Alternative 3 with a wildfire (2020) weighted average canopy cover and basal area are anticipated to remain within the range noted for occupancy with canopy cover retained at 51 percent and basal area at the highest at 298 sq.ft./acre (Figure 33).

The overall distribution of snags across the landscape is anticipated to remain relatively stable with a slight increase reflected with a selection of Alternative 3 at an estimated 8.1 snags per acre (2020) with similar effects as discussed under the spotted owl and northern goshawk section for this attribute (see pages 155-156). Given prior treatment followed by a wildfire (2020), snag values would be expected to increase to approximately 10 snags per acre.

A selection of Alternative 3 would allow fuels reduction to occur over much of project area while reintroducing fire as a natural process. Adequate dead and down material would be retained and high intensity fire potential would be reduced. This outcome provides greater stability in maintaining marten habitat across the landscape while retaining the greatest set of desirable stand features.

BAT SPECIES (PALLID AND FRINGED MYOTIS BATS):

Metric 1. Change in snag density and distribution: With a selection of Alternative 1, the availability of snags and their distribution would remain similar to existing conditions previously discussed for this attribute (see Figure 30 and discussion). A selection of this Alternative would carry forward the risk for habitat loss in a summer wildfire event given current stand conditions and existing ground fuels. With a wildfire event, a substantial increase in snag density is anticipated to occur increasing from approximately 6.6 snags per acres to an estimated 25 snags per acre.

Under Alternative 2, potential impacts would be limited to the affected area where fuels reduction work would occur on approximately 1,400 acres, or roughly half of the project area. In this alternative, snags which pose an imminent safety hazard (regardless of size class) would be felled. It is possible that individuals, as well as suitable roosting and maternal cavity habitats utilized by these species, may be affected particularly if larger size snags are felled. Despite this felling, FVS modeling predicts there would be an incremental increase in the overall snag density from 6.6 snags per acre to 7.2 snags per acre across the project area post implementation (2020), with snags greater than 24 inches dbh also slightly increasing from 3.2 snags per acre to approximately 3.5 snags per acre (2020, Figure 30).

Under Alternative 3, fuels reduction activities would occur over the majority of the project area. With a selection of Alternative 3, the availability of snags and their distribution would remain similar to existing conditions. A selection of Alternative 3 would decrease the risk for habitat loss in a summer wildfire event over the other alternatives. Expected flame lengths and rate of spread of fire would be substantially lower with Alternative 3 than with either Alternative 1 or 2. Therefore the impact on important forest stand attributes for these species such as large snags has the least potential for loss.

Both species are known to normally occur in relatively low density, over a wide range of habitats types ranging from oak savannah, mixed deciduous and conifer forests, to coastal redwood and giant sequoia habitats. They also utilize a variety of roosting structures other than large snags, such as live tree hollows in giant sequoia trees, rock crevices, caves, abandoned mines and buildings. Given the limited amount of habitat impacted under the action alternatives in contrast to the unaffected habitat at the broader landscape scale (upper Tule River basin), no significant decrease in the number of individuals or loss of young over the short or long term is anticipated.

Metric 2. Change in the availability of large Giant Sequoias: Both bats species have been associated with the use of large giant sequoia trees where basal cavities exist. Under Alternative 1, no change in the relative abundance or distribution of large giant sequoias is anticipated to occur based on their size and ability to withstand fire (pers. Comm. G.Powell 2013). Fire effects may include high flame lengths given current fuel loading and ladder fuels. This may result in alterations (both positive and negative) in basal cavity structure and function influencing bat use. Wildfire may also increase the development of new basal cavities previously not present. Therefore, negligible change in these attributes and their availability is anticipated over the short or long term.

Under Alternatives 2 or 3, no change in the relative numbers or distribution of large giant sequoias is anticipated to occur since only small diameter material would be removed. Fuels treatments such as pile and burn, jackpot pile and burn, or understory burn would implement measures to prevent loss of these large structures. Measures would be taken to pull away heavy fuels loads if present to minimize damage.

Should a wildfire event take place, impacts to large giant sequoias are anticipated to be negligible. Therefore impacts to existing basal hollows that could be occupied by bats would remain unaffected. Post treatment, site conditions are anticipated to result in a decreased rate of fire spread and lower flame heights than prior to fuel treatment

Cumulative Effects

As described earlier for the Wildlife BA, a vegetation layer created from several sources was utilized for baseline estimations of habitat. The cumulative effects (CE) analysis area for the species considered varies, and was based primarily on anticipated home range extent. For the California spotted owl, northern goshawk, marten, and bat species a CE extent area of 1.5 mile radius was established. This area was sufficient to incorporate a typical home range as noted in literature. For a wide-ranging species such as the fisher, the Southern Sierra sub-population area was used. Tucker et al. (Tucker, et al., 2009) found a basis for identification of fisher sub populations in the Southern Sierra Fisher Conservation Area based on rates of genetic exchange. The TRRP Project falls within the 3rd sub-population area comprised by the Kern Plateau and southern portion of the west slope of the Sequoia National Forest. Table 61 displays the cumulative effects area of consideration for each species, the total suitable habitat (acres) available on NFS lands and non-NFS land inside the cumulative effects boundary, and the estimated suitable habitat for each species in the TRRP project area.

Table 61: Species-specific cumulative effects area (acres)

Species Name	CE Analysis Area of Consideration and Total Estimated Acres	Suitable Habitat on FS Lands	Suitable Habitat on Non-FS Lands	Total Suitable Habitat in Defined Cumulative Effects Analysis Area	Suitable Habitat within Proposed Treatment Area
California Spotted Owl & Northern Goshawk	1.5 mile radius, 15,803 acres.	8,182	2,601	10,783	2,137
Marten		7,100	1,571	8,671	2,061
Pallid Bat		933	473	1,460	5
Fringed Myotis Bat		4,385	2,299	6,684	479
Fisher	Southern Sierra sub-population area, comprising the Kern Plateau and southern portion of the west slope of the Sequoia National Forest, 716,901 Acres	242,524	11,289	253,813	2,295

Table 62 provides a summary of past, present, and reasonably foreseeable actions for species-specific cumulative effects analysis. A detailed listing of these actions can be reviewed in the cumulative effects analysis in the Wildlife BE.

Table 62: Summary of past, present, and reasonably foreseeable actions for species-specific cumulative effects

Species	Land Ownership	Current Suitable Habitat (acres)	Past/ Current Commercial Thin and Associated Fuels Treatment (acres)	Past /Current Fuels Reduction Projects (Non-commercial) (acres)	Habitat Affected by TRRPP Action Alternatives (acres)	Total Habitat Affected by Past, Present, and Foreseeable Actions (Acres) and Cumulative Effects Analysis Area (percent)
Fisher	N.F.	242,524	11,543	4,839	2,295	18,677 (8)
	Non-FS	11,289	1,265	0	0	1,265 (11)
California Spotted Owl & Northern Goshawk	N.F.	8,182	0	197	2,137	2,334 (29)
	Non-FS	2,601	0	0	0	0
Pallid Bat	N.F.	473	0	2	5	7 (1)
	Non-FS	460	0	0	0	0
Marten	N.F.	7,100	0	197	2,061	(32)
	Non-FS	1,571	0	0	0	0
Fringed Myotis Bat	N.F.	4,385	0	132	479	611 (14)
	Non-FS	2,299	0	0	0	0
N.F.=National Forest, Non-FS=Non-Forest Service land.						

Fire History: Two wildfires have occurred within the Sierra sub-population cumulative effects analysis area since the last vegetation mapping update. These fires collectively burned an estimated 6,860 acres of CWHR 2.1 habitats. Based on fire severity mapping approximately 710 acres were unburned, 2,905 acres were burned at low severity, 3,100 acres were burned at moderate severity, and 145 acres at high severity. The largest of the two fires occurred following an exceptionally wet winter, with above normal snow pack and rain. Therefore field conditions experienced during the fire were still unseasonably moist, lowering fire effects such as torching or crown fire and the complete loss of large-size class down woody debris. Some canopy cover reduction occurred in moderate and high burn severity areas, but habitat conditions remained relatively stable in unburned or low severity burn areas.

Recreational Activity: Recreation activities are similar within cumulative effects analysis areas, and are generally tied to road and trail related activities such as hiking, equestrian, off highway vehicle or over snow vehicle (OHV/OSV) uses and hunting.

Livestock Grazing: The majority of the established cumulative effect analysis areas contain one or more grazing allotments under permit.

Alternatives 2 and 3 -

California Spotted Owl, Northern Goshawk, Marten, Pallid Bat and Fringed Myotis Bat:

The TRRP Project action alternatives in light of past, present, and reasonably foreseeable actions would not result in negative influences to the sensitive species listed or their habitats. Prior commercial harvest or fuels reduction projects since the last mapping update in conjunction with the proposed action, encompassed approximately 29 percent of the available habitat for the spotted owl and northern goshawk, 32 percent of the available marten habitat, one percent for the available pallid bat habitat and 14 percent of the available fringed myotis habitat (Table 61). These prior actions are anticipated to have minimal influence on individuals or suitable habitats. Silvicultural prescriptions for previous projects on NFS lands were crafted under either the CASPO EA or SNFPA FEIS (USDA 2001). Therefore, specific standards and guidelines were incorporated to retain all large live trees and snags (30 inches dbh and greater) unless deemed a safety hazard, and to retain an adequate recruitment pool of mid-sized trees to provide for their replacement over time. Some minor decreases in canopy cover are anticipated with fuel reduction work, however, these decreases are not expected to preclude use of existing habitat. No treatments have occurred in previous projects within spotted owl or goshawk PACs, and appropriate limited operation periods were applied since activities may be within ¼ mile of the last designated nest site. The current action alternatives under the TRRP Project are not anticipated to dramactically decrease acres of suitable habitat or to render them unsuitable, thereby precluding future use. Proposed actions are anticipated to tie in with prior fuels reduction projects that would collectively aid in the protection of suitable habitat in the upper Tule River Basin, the TRRP project area, and the Reservation. These actions are anticipated to provide for the retention of desirable habitat attributes over the long term.

Fisher

The TRRP Project action alternatives in light of past, present, and reasonable foreseeable actions would not result in negative influences to individuals or their habitat. Prior commercial harvest and fuels reduction projects in conjunction with the proposed action on Forest Service system lands , encompass approximately 19 percent of the the southern Sierra sub-population cumulative effects area. This includes eight percent on NFS lands and 11 percent on privately held lands, as identified in state and private forestry THPs. These actions are anticipated to have minimal influence on fisher habitat. Silvicultural prescriptions for projects on NFS lands were crafted under the CASPO EA or SNFPA FEIS (USDA 2001 and 2004). Therefore, specific standards and guidelines have been incorporated to retain all large live trees and snags (30 inch dbh and greater), unless deemed a safety hazard. Measures also place emphasis on retaining a sufficient recruitment pool of mid sized trees to provide for their replacement overtime. Wildfires have impacted an additional three percent of the available habitat but approximately half of this habitat is considered still suitable for continued use.

All Species

Existing background levels of recreation activities occur (hunting, fishing, and OHV/OSV) but are limited in scope, distribution and duration. No new campground facilities or road construction have been identified with the TRRP Project. Livestock grazing has been an ongoing activity prior to the establishment of Sequoia National Forest, and is presently at substantially lower levels than what historically occurred. Grazing use, which is monitored annually for compliance, adheres to current standards and guidelines. Appropriate BMPs for natural resource protection, and grazing utilization standards, are enforced to maintain adequate forage and shrub cover for the species considered and their prey.

Determination

Region 5 Forest Service Sensitive Species: California spotted owl, northern goshawk, marten, fisher, pallid bat, and fringed myotis bat:

The analysis modeled the impact of a potential wildfire event to show changes in vegetation over time; however, there is no guarantee an unplanned wildfire would occur. Thus, there would be no effects by not doing the project, and the Wildlife Biologist determined that implementation of Alternative 1 of the TRRP Project will have “No Effect” on the species addressed.

Standards and guidelines established in the Monument Plan are a part of Alternatives 2 and 3. These measures, in conjunction with standard Best Management Practices, would be implemented. This would decrease the potential for disturbance during the critical time frames in the nest/den period, and assist in the retention of suitable habitat and structural elements necessary for these species. These include maintenance of elements most at risk, and difficult to replace, such as large live trees, snags, and down woody debris.

Post implementation, minor decreases in canopy cover may occur in some CHWR types; however, stand conditions retained would be within the range to continue species occupation. Implementation of either Action Alternative is not expected to result in substantial shifts in habitat quality or quantity from what currently exist throughout the TRRP project area, and would maintain suitable habitat elements necessary for these species over the landscape. Risk of uncharacterisitcally severe fire disturbances which would negatively impact the species would be reduced. Therefore, the Wildlife Biologist determined that the TRRP Project **"may affect individuals"** but **“would not lead to a trend toward federal listing or a loss of viability"** for the California spotted owl, northern goshawk, marten, fisher, pallid bat or the fringed myotis bat.

This information is drawn from the Wildlife BA, and Wildlife BE Reports (Galloway 2014), which are hereby incorporated by reference.

Management Indicator Species

According to the *Management Indicator Species Report for the Tule River Reservation Protection Project* (MIS Report) (Cordes 2014), the following section documents the analysis for the following 'MIS Category 3' species: fox sparrow, mule deer, mountain quail, sooty grouse, California spotted owl, American marten, northern flying squirrel, and hairy woodpecker. The analysis of the effects of the TRRP Project on the MIS habitat for the selected project-level MIS is conducted at the project scale. Detailed information on the MIS is documented in the 2010 SNF Bioregional MIS Report (USDA 2010a), which is hereby incorporated by reference.

The cumulative effects analysis area is the Middle Fork Tule River watershed, which covers 70,321 acres. The temporal scale for the analysis is 2004 to 2018. Past actions prior to 2004 are incorporated in the current GIS vegetation layer. Five years from the present is the period of time the direct effects of the project should occur and for which there is information on reasonably foreseeable future actions in the analysis area. For assessment of future projects, the Forest completes a quarterly "Schedule of Proposed Actions (SOPA)" which tracks proposals that are ongoing or have sufficient detail to insure they are reasonably foreseeable. The SOPA published on 4/1/2013 had no projects planned in the Middle Fork Tule River Watershed. Projects considered in the cumulative effects analysis are summarized in Table 63. Acres used in this analysis are rounded to the nearest whole number.

Climate changes would likely cause changes in the distribution of MIS in the project area. Modeling efforts have projected that forest types and other vegetation dominated by woody plants in California would migrate to higher elevations as warmer temperatures make those areas suitable for colonization and survival. For example, with higher temperatures and a longer growing season, the area occupied by subalpine and alpine vegetation was predicted to decrease as evergreen conifer forests and shrublands migrate to higher elevations. The precise effects of climate change on individual MIS are difficult to predict and are not be addressed in the effects analysis.

Cumulative effects at the bioregional scale are tracked via the SNF MIS Bioregional monitoring, and detailed in the 2010 SNF Bioregional MIS Report (USDA 2010a).

Table 63: Past, Present, and Future Projects Affecting MIS Habitat

Project type	Projects	Acres of MIS Habitats Impacted	
Fuels Reduction	Camp Nelson, Ponderosa	Shrubland	102 acres
		Oak-associated Hardwood & Hardwood/conifer	624 acres
		Early and Mid Seral Coniferous Forest	379 acres
		Late Seral Closed Canopy Coniferous Forest	88 acres
Past Wildfires	Deep, Wishon, River, Maggie, Stairs, Moses	Shrubland	1,754 acres
		Oak-associated Hardwood & Hardwood/conifer	922 acres
		Early and Mid	154 acres

Project type	Projects	Acres of MIS Habitats Impacted	
		Seral Coniferous Forest	
		Late Seral Closed Canopy Coniferous Forest	27 acres
Potential Future Vegetation Mgt. Projects	None listed on the current SOPA		0 acres

<u>Shrubland (West-slope Chaparral) Habitat (Fox Sparrow)</u>

Habitat/Species Relationship.

The fox sparrow was selected as the MIS for shrubland (chaparral) habitat on the west slope of the Sierra Nevada, comprised of montane chaparral (MCP), mixed chaparral (MCH), and chamise-redshank chaparral (CRC) as defined by the CWHR System (CDFG 2005). Recent empirical data from the Sierra Nevada indicate that the fox sparrow is dependent on open shrub-dominated habitats for breeding (Burnett and Humple 2003, Burnett et al. 2005, Sierra Nevada Research Center 2007).

Shrubland (West-Slope Chaparral) Habitat Factor(s) for the Analysis:

(1) Acres of shrubland (chaparral) habitat [CWHR montane chaparral (MCP), mixed chaparral (MCH), and chamise-redshank chaparral (CRC)].

(2) Acres with changes in shrub ground cover class (Sparse=10-24 percent; Open=25-39 percent; Moderate=40-59 percent; Dense=60-100 percent).

(3) Acres with changes in CWHR shrub size class (Seedling shrub (seedlings or sprouts <3years); Young shrub (no crown decadence); Mature Shrub (crown decadence 1-25 percent); Decadent shrub (>25 percent).

Direct and Indirect Effects

Within the 2,838 acre project area, there are approximately 12 acres of shrubland habitat. About nine of the acres are montane chaparral and three of the acres are mixed chaparral.

Under Alternative 2, only six acres of shrubland habitat are within treatment areas, and under Alterative 3 all 12 acres are within the treatment areas. Under either action alternative, shrubs may be cut or burned in these areas to reduce ladder fuels. The short term effects of the project would include a loss of shrub ground cover following the thinning or burning of shrubs. The size class of shrubs would change from decadent to seedling and young shrub as new sprouting occurs. Implementation of this alternative would result in (1) no change in acres of shrubland habitat (Alternative 1), (2) a reduction in shrub ground cover classes on a maximum of six acres (Alternative 2) or 12 acres (Alternative 3) of shrubland habitat, and (3) a reduction in CWHR size classes on a maximum of six acres (Alternative 2) or 12 acres (Alternative 3).

Cumulative Effects

Past and current fuels reduction projects reduced shrub ground cover and size class on approximately 102 acres (Table 65). Recent wildfires have affected a maximum of 1,754 acres of shrubland. There are no planned future projects in the analysis area with the potential to affect shrubland habitat.

The direct, indirect, and cumulative effects of Alternative 2 of the TRRP Project would result in (1) no change in acres of shrubland habitat, (2) a reduction in shrub ground cover classes on a maximum of 1,862 acres (Alternative 2) or 1,868 acres (Alternative 3) of shrubland habitat, and (3) a reduction in CWHR size classes of shrubs on a maximum of 1,862 acres (Alternative 2) or 1,868 acres (Alternative 3). This represents 21 percent of the shrubland in the Middle Fork Tule River watershed analysis area under either action alternative.

Summary of Status and Trend at the Bioregional Scale

The Sequoia NF LRMP (as amended by the SNF MIS Amendment) requires bioregional-scale habitat and distribution population monitoring for the MIS; hence, the effects analysis for the TRRP Project must be informed by both habitat and distribution population monitoring data. The sections below summarize the habitat and distribution population status and trend data for the fox sparrow, mule deer, mountain quail, sooty grouse, California spotted owl, American marten, northern flying squirrel, and hairy woodpecker. This information is drawn from the detailed information on habitat and population trends in the 2010 Sierra Nevada Forests Bioregional MIS Report (USDA Forest Service 2010a), which is hereby incorporated by reference.

Summary of Fox Sparrow Status and Trend at the Bioregional Scale

> **Habitat Status and Trend.** There are currently 1,009,681 acres of west-slope chaparral shrubland habitat on NFS lands in the Sierra Nevada. Over the last two decades, the trend is slightly increasing (changing from eight percent to nine percent of the acres on NFS lands).
>
> **Population Status and Trend.** Monitoring of fox sparrows across the ten national forests in the Sierra Nevada has been conducted since 2009 in partnership with the Point Reyes Bird Observatory (PRBO) Conservation Science, as part of a monitoring effort that also includes mountain quails, hairy woodpeckers, and yellow warblers (USDA Forest Service 2010a, http://data.prbo.org/partners/usfs/snmis/). Fox sparrows were detected in 36.9 percent of 1,659 point counts in 2009 and 44.3 percent of 2,266 point counts in 2010, with detections on all 10 national forests in both years. The average abundance (number of individuals recorded on passive point count surveys) was 0.563 in 2009 and 0.701 in 2010. These data indicate that fox sparrows continue to be distributed across the 10 Sierra Nevada national forests. In addition, fox sparrows continue to be monitored and surveyed in the Sierra Nevada at various sample locations by avian point count, spot mapping, mist-net, and breeding bird survey protocols. These are summarized in the 2008 Bioregional Monitoring Report (USDA 2008c). Current data at the range-wide, California, and Sierra Nevada scales indicate that, although there may be localized declines in the population trend, the distribution of fox sparrow populations in the Sierra Nevada is stable.

Relationship of Project-Level Habitat Impacts to Bioregional-Scale Fox Sparrow Trend. Since the alternatives in the TRRP Project would result in a reduction in shrub ground cover and size class on less than one percent of existing shrubland habitat, this project would not alter the existing trend in the habitat, nor would it lead to a change in the distribution of fox sparrows across the Sierra Nevada bioregion.

<u>Oak-Associated Hardwoods and Hardwood/Conifer Habitat (Mule deer)</u>

Habitat/Species Relationship.

The mule deer was selected as the MIS for oak-associated hardwood and hardwood/conifer in the Sierra Nevada, comprised of montane hardwood (MHW) and montane hardwood-conifer (MHC) as defined by the CWHR System (CDFG 2005). Mule deer range and habitat includes coniferous forest, foothill woodland, shrubland, grassland, agricultural fields, and suburban environments (CDFG 2005). Many mule deer migrate seasonally between higher elevation summer range and low elevation winter range (Ibid). On the west slope of the Sierra Nevada, oak-associated hardwood and hardwood/conifer areas are an important winter habitat (CDFG 1998).

Oak-Associated Hardwoods and Hardwood/Conifer Habitat Factor(s) for the Analysis:

(1) Acres of oak-associated hardwood and hardwood/conifer habitat [CWHR montane hardwood (MHW), montane hardwood-conifer (MHC)].

(2) Acres with changes in hardwood canopy cover (Sparse=10-24 percent; Open=25-39 percent; Moderate=40-59 percent; Dense=60-100 percent).

(3) Acres with changes in CWHR size class of hardwoods [1/2 (Seedling/Sapling) (<6" dbh); 3 (Pole) (6"-10.9" dbh); 4 (Small tree) (11"-23.9" dbh); 5 (Medium/Large tree) (≥24" dbh)]

Direct and Indirect Effects

Within the 2,838 acre project area, there are approximately 479 acres of oak-associated hardwood and hardwood/conifer habitat. Approximately 243 of the acres are montane hardwood-conifer and 236 acres are montane hardwood.

Under the No Action alternative there would be no changes in oak-associated hardwoods and hardwood/conifer habitat.

For Alternative 2, treatments within oak-associated hardwoods and hardwood/conifer habitat include thinning and ladder fuel reduction on approximately 159 acres, and 476 acres for Alternative 3. The thinning would focus on cedar and firs, with oaks retained. Although the silviculture prescription favors the retention of oaks, some trees may be felled if they are under 12 inches dbh. Implementation of this alternative would result in (1) no change in acres of oak-associated hardwood and hardwood/conifer habitats, (2) a possible reduction of hardwood canopy cover following thinning, and (3) no change in CWHR size classes of hardwoods on any acres.

Cumulative Effects

Past and current fuels reduction projects included hazard tree removal in oak-associated hardwood and hardwood/conifer habitats (Table 58). Recent wildfires have affected a maximum of 922 acres of oak-associated hardwood and hardwood/conifer habitats. There are no planned future projects in the analysis area with the potential to affect oak-associated hardwood and hardwood/conifer habitat.

The direct, indirect, and cumulative effects of the TRPP Project action alternatives would result in: (1) no change in acres of oak-associated hardwood and hardwood/conifer habitats, (2) a possible reduction in hardwood canopy cover classes on a maximum of 1,081 acres (Alternative 2) or 1,400 acres (Alternative 3) due to mortality during fires and thinning (representing six to seven percent of the oak-associated hardwood and hardwood/conifer habitat in the Middle Fork Tule River watershed, respectively), and (3) no change in CWHR size classes of hardwoods on any acres.

Summary of Mule Deer Status and Trend at the Bioregional Scale

Habitat Status and Trend. There are currently 808,006 acres of oak-associated hardwood and hardwood/mixed conifer habitat on NFS lands in the Sierra Nevada. Over the last two decades, the trend is slightly increasing (changing from five to seven percent of the acres on NFS lands).

Population Status and Trend. The mule deer has been monitored in the Sierra Nevada at various sample locations by herd monitoring (spring and fall) and hunter survey and associated modeling (CDFW 2007, 2010). California Department of Fish and Wildlife (CDFW) conducts surveys of deer herds in early spring to determine the proportion of fawns that have survived the winter, and conducts fall counts to determine herd composition (CDFW 2007). This information, along with prior year harvest information, is used to estimate overall herd size, sex and age ratios, three-year average populations, and the predicted number of bucks available to hunt (CDFW 2007, 2010). These data indicate that mule deer continue to be present across the Sierra Nevada, and current data at the range wide, California, and Sierra Nevada scales indicate that, although there may be localized declines in some herds or Deer Assessment Units, the distribution of mule deer populations in the Sierra Nevada is stable.

Relationship of Project-Level Habitat Impacts to Bioregional-Scale Mule Deer Trend. Since the alternatives in the TRRP Project would result in no change in acres or CWHR size classes of oak-associated hardwood and hardwood/conifer habitat, and a possible reduction of canopy cover on less than one percent of the available habitat, this project would not alter the existing trend in the habitat, nor would it lead to a change in the distribution of mule deer across the Sierra Nevada bioregion.

<u>Early and Mid Seral Coniferous Forest Habitat (Mountain quail)</u>

Habitat/Species Relationship.

The mountain quail was selected as the MIS for early and mid seral coniferous forest (ponderosa pine, Sierran mixed conifer, white fir, red fir, and eastside pine) habitat in the Sierra Nevada. Early seral coniferous forest habitat is comprised primarily of seedlings (<1" dbh), saplings (1"-5.9" dbh), and pole-sized trees (6"-10.9" dbh). Mid seral coniferous forest habitat is comprised primarily of small-sized trees (11"-23.9" dbh). The mountain quail is found particularly on steep slopes, in open, brushy stands of conifer and deciduous forest and woodland, and chaparral; it may gather at water sources in the summer, and broods are seldom found more than 0.8 km (0.5 mi) from water (CDFG 2005).

Early and Mid Seral Coniferous Forest Habitat Factor(s) for the Analysis:

(1) Acres of early (CWHR tree sizes 1, 2, and 3) and mid seral (CWHR tree size 4) coniferous forest (ponderosa pine, Sierran mixed conifer, white fir, red fir, and eastside pine) habitat [CWHR ponderosa pine (PPN), Sierran mixed conifer (SMC), white fir (WFR), red fir (RFR), Jeffrey pine (JPN), tree sizes 1, 2, 3, and 4, all canopy closures].
(2) Acres with changes in CWHR tree size class.
(3) Acres with changes in tree canopy closure.
(4) Acres with changes in understory shrub canopy closure.

Direct and Indirect Effects

In the project area, there are 283 acres of early seral coniferous forest (SMC) and 689 acres of mid seral coniferous forest (SMC). Under the No Action alternative there would be no changes in early and mid seral coniferous forest habitat.

For Alternative 2, treatment within early seral and mid seral coniferous forest habitat includes thinning and ladder fuel reduction on approximately 565 acres, and approximately 906 acres for Alternative 3. Prescribed underburning would occur on an additional 75 acres of early seral and mid seral coniferous forest habitat in Alternative 2, and 62 acres in Alternative 3.

Implementation would result in: (1) no change in acres of early and mid seral coniferous forest habitat, (2) no change in CWHR tree size class on any acres, (3) a reduction in tree canopy closure on a maximum of 640 acres (Alternative 2) or 968 acres (Alternative 3), and (4) a decrease in understory shrub canopy cover on a maximum of 640 acres or 968 acres (Alternative 3).

Cumulative Effects

Past and current fuels reduction projects reduced tree canopy closure and understory shrub cover on approximately 379 acres. Recent wildfires have affected a maximum of 154 acres of early and mid seral coniferous forest. There are no planned future projects in the analysis area with the potential to affect early and mid seral coniferous forest habitat.

The direct, indirect, and cumulative effects of the TRRP Project would result in: (1) no change in acres of early and mid seral coniferous forest habitat, (2) no change in CWHR tree size class on any acres, (3) a reduction in tree canopy closure on 1,173 acres (Alternative 2) or 1,501 acres (Alternative 3) of early and mid seral coniferous habitat, and (4) a decrease in understory shrub canopy cover on a maximum of 1,173 acres (Alternative 2) or 1,501 acres (Alternative 3). This represents about five to seven percent of the early and mid seral coniferous habitat in the Middle Fork Tule River watershed, respectively.

Summary of Mountain Quail Status and Trend at the Bioregional Scale

> **Habitat Status and Trend.** There are currently 530,851 acres of early seral and 2,776,022 acres of mid seral coniferous forest (ponderosa pine, Sierran mixed conifer, white fir, and red fir) habitat on NFS lands in the Sierra Nevada. Over the last two decades, the trend for early seral is decreasing (changing from nine to five percent of the acres on NFS lands) and the trend for mid seral is increasing (changing from 21 to 25 percent of the acres on NFS lands).
>
> **Population Status and Trend.** Monitoring of mountain quail across the ten national forests in the Sierra Nevada has been conducted since 2009 in partnership with PRBO Conservation Science, as part of a monitoring effort that also includes fox sparrows, hairy woodpeckers, and yellow warblers (USDA Forest Service 2010a, http://data.prbo.org/partners/usfs/snmis/). Mountain quail were detected in 40.3 percent of 1,659 point counts (and 48.6 percent of 424 playback points) in 2009 and in 47.4 percent of 2,266 point counts (and 55.3 percent of 492 playback points) in 2010, with detections in all 10 national forests in both years. The average abundance (number of individuals recorded on passive point count surveys) was 0.103 in 2009 and 0.081 in 2010. These data indicate that mountain quail continue to be distributed across the 10 Sierra Nevada national forests. In addition, mountain quail continue to be monitored and surveyed in the Sierra Nevada at various sample locations by hunter survey, modeling, and breeding bird survey protocols. These are summarized in the 2008 Bioregional Monitoring Report (USDA 2008c). Current data at the range-wide, California, and Sierra Nevada scales indicate that the distribution of mountain quail populations in the Sierra Nevada is stable.

Relationship of Project-Level Habitat Impacts to Bioregional-Scale Mountain Quail Trend.

Since the direct, indirect, and cumulative effects of the alternatives in the TRRP Project would result in no change in early and mid seral coniferous forest habitat acres and size classes and moderate change in canopy closure and shrub understory on less than one percent of the available habitat, this project would not alter the existing trend in the habitat, nor would it lead to a change in the distribution of mountain quail across the Sierra Nevada bioregion.

Late Seral Open Canopy Coniferous Forest Habitat [Sooty (blue) grouse]

Habitat/Species Relationship.

The sooty grouse was selected as the MIS for late seral open canopy coniferous forest (ponderosa pine, Sierran mixed conifer, white fir, red fir, and eastside pine) habitat in the Sierra Nevada. This habitat is comprised primarily of medium/large trees (equal to or greater than 24" dbh) with canopy closures less than 40 percent. Sooty grouse occurs in open, medium to mature-aged stands of fir, Douglas-fir, and other conifer habitats, interspersed with medium to large openings, and available water, and occupies a mixture of mature habitat types, shrubs, forbs, grasses, and conifer stands (CDFG 2005). Empirical data from the Sierra Nevada indicate that sooty grouse select hooting sites that are located in open, mature, fir-dominated forest, where particularly large trees are present (Bland 2006).

Project-level Effects Analysis - Late Seral Open Canopy Coniferous Forest Habitat Factor(s) for the Analysis:

(1) Acres of late seral open canopy coniferous forest (ponderosa pine, Sierran mixed conifer, white fir, red fir, and eastside pine) habitat [CWHR ponderosa pine (PPN), Sierran mixed conifer (SMC), white fir (WFR), red fir (RFR), eastside pine (EPN), tree size 5, canopy closures S and P].
(2) Acres with changes in tree canopy closure class.
(3) Acres with changes in understory shrub canopy closure class.

Direct and Indirect Effects

There are 65 acres of late-seral, open canopy coniferous forest in the TRRP project area. This is composed entirely of Sierran mixed conifer 5P. Canopy cover is unknown for 30 acres of late seral forest in the project area and these acres are excluded from the analysis. Under the No Action alternative there would be no changes in late seral, open canopy coniferous forest habitat.

For Alternative 2, treatment within late seral, open canopy coniferous forest habitat includes thinning and ladder fuel reduction on approximately 37 acres. Implementation would result in: (1) no change in acres of late seral, open canopy coniferous forest habitat, (2) a slight reduction in tree canopy closure on a maximum of 37 acres (Alternative 2) or 65 acres (Alternative 3), and (3) a reduction in understory shrub canopy closure on a maximum of 37 acres (Alternative 2) or 65 acres (Alternative 3).

Cumulative Effects

None of the past, present, and reasonably foreseeable future actions in the analysis area would affect late seral, open canopy coniferous forest habitat (Table 63). The direct, indirect, and cumulative effects of the TRRP Project would result in: (1) no change in acres of late seral, open canopy coniferous forest habitat, (2) a slight reduction in tree canopy closure on a maximum of 37 acres (Alternative 2) or 65 acres (Alternative 3), and (3) a reduction in understory shrub canopy closure on a maximum of 37 acres (Alternative 2) or 65 acres (Alternative 3). This represents about 19 or 34 percent of the late seral, open canopy coniferous habitat in the Middle Fork Tule River watershed, respectively.

Summary of Sooty Grouse Status and Trend at the Bioregional Scale

> **Habitat Status and Trend.** There are currently 63,795 acres of late seral open canopy coniferous forest (ponderosa pine, Sierran mixed conifer, white fir, red fir, and eastside pine) habitat on NFS lands in the Sierra Nevada. Over the last two decades, the trend is decreasing (changing from three to one percent of the acres on NFS lands).

Population Status and Trend. The sooty grouse has been monitored in the Sierra Nevada at various sample locations by hunter survey, modeling, point counts, and breeding bird survey protocols, including California Department of Fish and Game Blue (Sooty) Grouse Surveys (Bland 1993, 1997, 2002, 2006); California Department of Fish and Game hunter survey, modeling, and hunting regulations assessment (CDFG 2004a, CDFG 2004b); Multi-species inventory and monitoring on the Lake Tahoe Basin Management Unit (LTBMU 2007); and 1968 to present – BBS routes throughout the Sierra Nevada (Sauer et al. 2007). These data indicate that sooty grouse continue to be present across the Sierra Nevada, except in the area south of the Kern Gap, and current data at the range-wide, California, and Sierra Nevada scales indicate that the distribution of sooty grouse populations in the Sierra Nevada north of the Kern Gap is stable.

Relationship of Project-Level Habitat Impacts to Bioregional-Scale Sooty Grouse Trend.

Since the direct, indirect, and cumulative effects of the alternatives in the TRRP Project would result in no change in acres of late seral open canopy coniferous forest habitat and changes in tree canopy closure and understory shrub canopy closure on less than one percent of the available habitat, this project would not alter the existing trend in the habitat, nor would it lead to a change in the distribution of sooty grouse across the Sierra Nevada bioregion.

<u>Late Seral Closed Canopy Coniferous Forest Habitat (California spotted owl, American marten, and northern flying squirrel)</u>

Habitat/Species Relationship.

California spotted owl. The California spotted owl was selected as an MIS for late seral closed canopy coniferous forest (ponderosa pine, Sierran mixed conifer, white fir, and red fir) habitat in the Sierra Nevada. This habitat is comprised primarily of medium/large trees (equal to or greater than 24 inches dbh) with canopy closures above 40 percent within ponderosa pine, Sierran mixed conifer, white fir, and red fir coniferous forests, and multi-layered trees within ponderosa pine and Sierran mixed conifer forests. The California spotted owl is strongly associated with forests that have a complex multi-layered structure, large-diameter trees, and high canopy closure (CDFG 2005, USFWS 2006). It uses dense, multi-layered canopy cover for roost seclusion; roost selection appears to be related closely to thermoregulatory needs, and the species appears to be intolerant of high temperatures (CDFG 2005). Mature, multi-layered forest stands are required for breeding (Ibid). The mixed-conifer forest type is the predominant type used by spotted owls in the Sierra Nevada: about 80 percent of known sites are found in mixed-conifer forest, with 10 percent in red fir forest (USDA Forest Service 2001).

American Marten. The American marten was selected as an MIS for late seral closed canopy coniferous forest (ponderosa pine, Sierran mixed conifer, white fir, and red fir) habitat in the Sierra Nevada. This habitat is comprised primarily of medium/large trees (equal to or greater than 24inches dbh) with canopy closures above 40 percent within ponderosa pine, Sierran mixed conifer, white fir, and red fir coniferous forests, and multi-layered trees within ponderosa pine and Sierran mixed conifer forests. Martens prefer coniferous forest habitat with large diameter trees and snags, large down logs, moderate-to-high canopy closure, and an interspersion of riparian areas and meadows. Important habitat attributes are vegetative diversity, with predominately mature forest; snags; dispersal cover; and large woody debris (Allen 1982). Key components for westside and eastside marten habitat can be found in the Sierra Nevada Forest Plan Amendment FEIS (USDA Forest Service 2001), Volume 3, Chapter 3, part 4.4, pages 20-21.

Northern flying squirrel. The northern flying squirrel was selected as an MIS for late seral closed canopy coniferous forest (ponderosa pine, Sierran mixed conifer, white fir, and red fir) habitat in the Sierra Nevada. This habitat is comprised primarily of medium/large trees (equal to or greater than 24inches dbh) with canopy closures above 40 percent within ponderosa pine, Sierran mixed conifer, white fir, and red fir coniferous forests, and multi-layered trees within ponderosa pine and Sierran mixed conifer forests. The northern flying squirrel occurs primarily in mature, dense conifer habitats intermixed with various riparian habitats, using cavities in mature trees, snags, or logs for cover (CDFG 2005).

Late Seral Closed Canopy Coniferous Forest Habitat Factor(s) for the Analysis:
(1) Acres of late seral closed canopy coniferous forest (ponderosa pine, Sierran mixed conifer, white fir, and red fir) habitat [CWHR ponderosa pine (PPN), Sierran mixed conifer (SMC), white fir (WFR), red fir (RFR), tree size 5 (canopy closures M and D), and tree size 6].
(2) Acres with changes in canopy closure (D to M).
(3) Acres with changes in large snags (>15" dbh) per acre.

Direct and Indirect Effects

In the project area, there are approximately 1,278 acres of late seral closed canopy coniferous forest habitat (272 acres of SMC 5M, 250 acres of SMC 5D and 756 acres of SMC 6). Canopy cover is unknown for 30 acres of late seral forest in the project area and these acres are excluded from the analysis. Under the No Action alternative there would be no changes in late seral closed canopy coniferous forest habitat.

For Alternative 2, treatment within late seral closed canopy coniferous forest habitat includes thinning and ladder fuel reduction on approximately 334 acres, and 1,099 acres under Alternative 3. Prescribed underburning would only occur on an additional 202 acres of late seral closed canopy coniferous forest habitat in Alternative 2, and an additional 171 acres in Alternative 3.

Implementation would result in (1) no change in acres of late seral closed canopy coniferous forest habitat, (2) a slight reduction in canopy closure on a maximum of 536 acres (Alternative 2) or 1,270 acres (Alternative 3), (3) a possible reduction in the number of large snags (greater than 15 inches dbh) per acre if snags that pose an imminent safety hazard to the road or worker safety are felled.

Cumulative Effects

Past and current fuels reduction projects reduced canopy closure on a maximum of 88 acres. Recent wildfires have affected a maximum of 27 acres of late seral closed canopy coniferous forest. There are no planned future projects in the analysis area with the potential to affect late seral coniferous forest habitat.

The direct, indirect, and cumulative effects of the TRRP Project would result in: (1) no change in acres of late seral closed canopy coniferous forest habitat, (2) a slight reduction in canopy closure on a maximum of 651 acres (Alternative 2) or 1,385 acres (Alternative 3) (representing less than six to 12 percent of the late seral closed canopy coniferous habitat in the Middle Fork Tule River watershed, respectively), (3) a possible reduction in the number of large snags (greater than 15" dbh) per acre if snags that pose an imminent safety hazard are felled.

Summary of California spotted owl, American marten, and Northern flying squirrel Status and Trend at the Bioregional Scale

Habitat Status and Trend. There are currently 1,006,923 acres of late seral closed canopy coniferous forest (ponderosa pine, Sierran mixed conifer, white fir, and red fir) habitat on NFS lands in the Sierra Nevada. Over the last two decades, the trend is slightly increasing (changing from seven to nine percent of the acres on NFS lands); since the early 2000s, the trend has been stable at nine percent.

Population Status and Trend - California spotted owl. California spotted owls have been monitored in California and throughout the Sierra Nevada through general surveys, monitoring of nests and territorial birds, and demography studies (Verner et al. 1992; Gutierrez et al. 2008, 2009, 2010; USDA Forest Service 2001, 2004, 2006b; USFWS 2006; Sierra Nevada Research Center 2007, 2008, 2009, 2010). Current data at the rangewide, California, and Sierra Nevada scales indicate that, although there may be localized declines in population trend [e.g., localized decreases in "lambda" (estimated annual rate of population change)], the distribution of California spotted owl populations in the Sierra Nevada is stable.

Population Status and Trend – American marten. American martens have been monitored throughout the Sierra Nevada as part of general surveys and studies since 1996 (e.g., Zielinski et al. 2005, Moriarty 2009). Since 2002, American martens have been monitored on Sierra Nevada forests as part of the Sierra Nevada Forest Plan Amendment (SNFPA) monitoring plan (USDA 2005a, 2006b, 2007b, 2009, 2010b). Current data at the range-wide, California, and Sierra Nevada scales indicate that, although martens appear to be distributed throughout their historic range, their distribution has become fragmented in the southern Cascades and northern Sierra Nevada, particularly in Plumas County. The distribution appears to be continuous across high-elevation forests from Placer County south through the southern end of the Sierra Nevada, although detection rates have decreased in at least some localized areas (e.g., Sagehen Basin area of Nevada County).

Population Status and Trend – northern flying squirrel. Northern flying squirrels have been monitored in the Sierra Nevada at various sample locations by live-trapping, ear-tagging, camera surveys, snap-trapping, and radiotelemetry: 2002-present on the Plumas and Lassen National Forests (Sierra Nevada Research Center 2007, 2008, 2009, 2010), and 1958-2004 throughout the Sierra Nevada in various monitoring efforts and studies (see USDA 2008c, Table NOFLS-IV-1). These data indicate that northern flying squirrels continue to be present at these sample sites, and current data at the range-wide, California, and Sierra Nevada scales indicate that the distribution of northern flying squirrel populations in the Sierra Nevada is stable.

Relationship of Project-Level Habitat Impacts to Bioregional-Scale Trends.

California spotted owl. Since the direct, indirect, and cumulative effects of the alternatives of the TRRP Project would result in no change in late seral closed canopy coniferous forest habitat acres, a reduction in canopy closure and the average large snags per acre on less than one percent of the available habitat, this project would not alter the existing trend in the habitat, nor would it lead to a change in the distribution of California spotted owl across the Sierra Nevada bioregion.

American marten. Since the direct, indirect, and cumulative effects of the alternatives of the TRRP Project would result in no change in late seral closed canopy coniferous forest habitat acres, a reduction in canopy closure and the average large snags per acre on less than one percent of the available habitat, the TRRP Project would not alter the existing trend in the habitat, nor would it lead to a change in the distribution of American marten across the Sierra Nevada bioregion.

Northern flying squirrel. Since the direct, indirect, and cumulative effects of the alternatives of the TRRP Project would result in no change in late seral closed canopy coniferous forest habitat acres, a reduction in canopy closure and the average large snags per acre on less than one percent of the available habitat, the TRRP Project would not alter the existing trend in the habitat, nor would it lead to a change in the distribution of northern flying squirrel across the Sierra Nevada bioregion.

Snags in Green Forest Ecosystem Component (Hairy woodpecker)

Habitat/Species Relationship.

The hairy woodpecker was selected as the MIS for the ecosystem component of snags in green forests. Medium (diameter breast height between 15 to 30 inches) and large (diameter breast height greater than 30 inches) snags are most important. The hairy woodpecker uses stands of large, mature trees and snags of sparse to intermediate density; cover is also provided by tree cavities (CDFG 2005). Mature timber and dead snags or trees of moderate to large size are apparently more important than tree species (Siegel and DeSante 1999).

Snags in Green Forest Ecosystem Component Habitat Factor(s) for the Analysis:
(1) medium and large (greater than 15 inches dbh) snags per acre,
(2) large (greater than 30 inches dbh) snags per acre.

Direct and Indirect Effects

It is estimated that there are currently approximately six medium and large snags (greater than 15 inches dbh) per acre and two large (greater than 30 inches dbh) snags per acre in the TRRP project area. Under the No Action alternative there would be no changes in the number of snags per acre.

Alternatives 2 and 3 propose to retain all snags greater than 15 inches dbh, unless the snags pose a safety hazard. Prescribed fire treatments in these alternatives may both create new snags and result in the loss of some existing snags with little impact expected on the overall number of snags per acre in the project area.

Implementation of Alternative 2 or Alternative 3 would result in: (1) a possible reduction in the average number of medium and large snags per acre if safety hazard snags are felled; (2) a possible reduction in the average number of large snags (greater than 30 inches dbh) per acre if safety hazard snags are felled. The area from which safety hazards may be removed is greater in Alternative 3 (2,825 acres[9]) than in Alternative 2 (1,407 acres).

Cumulative Effects

Past and current fuels reduction projects only removed snags that were safety hazards (Table 63). Recent wildfires have affected a maximum of 1,216 acres of forested habitat in Middle Fork Tule River watershed (two percent of forested habitat in this watershed). These fires both created and destroyed snags. There are no planned future projects in the analysis area with the potential to affect snags.

The direct, indirect, and cumulative effects of Alternative 2 or Alternative 3 would result in: (1) a possible slight reduction in the average number of medium and large snags per acre if safety hazard snags are felled; (2) a possible slight reduction in the average number of large snags

[9] All habitat and treatment acres in the project area were generated using GIS mapping software. These values are approximate and may vary slightly between treatment areas and habitat totals based on specific habitat characteristics.

(greater than 30 inches dbh) per acre if safety hazard snags are felled. Alternative 3 could potentially reduce the number of medium and large snags per acre more than Alternative 2 because a larger number of acres would be in the treatment area.

Summary of Hairy Woodpecker Status and Trend at the Bioregional Scale

Ecosystem Component Status and Trend. The current average number of medium-sized and large-sized snags (greater than or equal to 15 inch dbh, all decay classes) per acre across major coniferous and hardwood forest types (westside mixed conifer, ponderosa pine, white fir, productive hardwoods, red fir, eastside pine) in the Sierra Nevada ranges from 1.5 per acre in eastside pine to 9.1 per acre in white fir. In 2008, snags in these types ranged from 1.4 per acre in eastside pine to 8.3 per acre in white fir (USDA 2008c).

Data from the early-to-mid 2000s were compared with the current data to calculate the trend in total snags per acre by Regional forest type for the 10 Sierra Nevada national forests and indicate that, during this period, snags per acre increased within westside mixed conifer (+0.76), white fir (+2.66), productive hardwoods (+0.35), and red fir (+1.25) and decreased within ponderosa pine (-0.16) and eastside pine (-0.14).

Detailed information by forest type, snag size, and snag decay class can be found in the 2010 SNF Bioregional MIS Report (USDA Forest Service 2010a).

Population Status and Trend. Monitoring of hairy woodpeckers across the ten National Forests in the Sierra Nevada has been conducted since 2009 in partnership with PRBO Conservation Science, as part of a monitoring effort that also includes mountain quail, fox sparrows, and yellow warblers (USDA Forest Service 2010a, http://data.prbo.org/partners/usfs/snmis/). Hairy woodpeckers were detected in 15.1 percent of 1,659 point counts (and 25.2 percent of 424 playback points) in 2009 and in 16.7 percent of 2,266 point counts (and 25.6 percent of 492 playback points) in 2010, with detections on all 10 national forests in both years. The average abundance (number of individuals recorded on passive point count surveys) was 0.116 in 2009 and 0.107 in 2010. These data indicate that hairy woodpeckers continue to be distributed across the 10 Sierra Nevada national forests. In addition, hairy woodpeckers continue to be monitored and surveyed in the Sierra Nevada at various sample locations by avian point counts and breeding bird survey protocols. These are summarized in the 2008 Bioregional Monitoring Report (USDA 2008c). Current data at the range-wide, California, and Sierra Nevada scales indicate that the distribution of hairy woodpecker populations in the Sierra Nevada is stable.

Relationship of Project-Level Habitat Impacts to Bioregional-Scale Hairy Woodpecker Trend.

Since the direct, indirect, and cumulative effects of the alternatives of the TRRP Project would result in a possible decrease in snags greater than 15 inches dbh and greater than 30 inches dbh per acre on less than 1 percent of the forested habitat available, this project would not alter the existing trend in snags, nor would it lead to a change in the distribution of hairy woodpecker across the Sierra Nevada bioregion.

This information is drawn from the MIS Report (Cordes 2014), which is hereby incorporated by reference.

Short-term Uses and Long-term Productivity

The consideration of "the relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity" (40 CFR 1502.16) is required by NEPA. This includes using all practicable means and measures, including financial and technical assistance, in a manner calculated to foster and promote the general welfare, to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generation of Americans (NEPA, Section 101). Discussion related to short-term uses and long-term productivity can be found in detail in the effects analysis discussions for the individual resources throughout this chapter.

Alternatives 2 and 3 would implement fuel reduction activities that could produce the greatest amount of short-term effects to soil and water quality, while providing the greatest long-term benefits in terms of prevention of and protection from wildfire. In contrast, in the event of a wildfire under extreme weather conditions in Alternative 1 could produce a great amount of short-term effects to soil and water quality, while providing limited long-term benefits in terms of prevention of and protection from wildfire.

Unavoidable Adverse Effects

There are no known unavoidable adverse effects from implementing either action alternative.

Irreversible and Irretrievable Commitments of Resources

There are no known irreversible or irretrievable commitments of resources from implementing either action alternative.

Other Required Disclosures

The National Environmental Policy Act directs that "to the fullest extent possible, agencies shall prepare draft EIS's concurrently with and integrated with…other environmental review laws and executive orders" (40 CFR 1502.25(a)).

In accordance with the Endangered Species Act, the TRRP planning team would consult as necessary with the U.S. Fish and Wildlife Service throughout the development of the draft and final EIS regarding the California condor and any other species that become known in the project area. Should satellite data suggest presence of condors on the Forest that would result in occupation of the TRRP vicinity, a limited operating period would be implemented in consultation with the Condor Recovery Team. The draft EIS is being sent to officials of the U.S. Fish and Wildlife Service for their review and comments.

Consultation with the National Marine Fisheries Service is not required due to the absence of anadromous fish and their habitat.

Management of the resources within TRRP Project in terms of cooperation with Native American and Tribal interests is governed by the laws and executive orders applicable to cultural resources, specifically ARPA, NAGPRA, Indian Sacred Sites (EO 13007), and Consultation and Coordination with Indian Tribal Governments (EO 13175).

The Tribal Forest Protection Act (TFPA) (Public Law 108-278) provides a tool for tribes to propose work on adjacent federal lands that would reduce the threat of fires starting on those lands from spreading onto trust lands for Indian tribes. The TRRP Project was proposed based on a request from the Tule River Indian Tribe under the Tribal Forest Protection Act. Tribal consultation has been on-going and included presentations to the Tule River Tribal Council.

In addition to the Tribal Forest Protection Act of 2004, other laws potentially applicable to the TRRP Project include the National Indian Forest Resources Management Act (NIFRMA) (Public Law 101-630, November 28, 1990), American Indian Religious Freedom Act (AIRFA) (Public Law 103-344, October 6, 1994), Healthy Forest Restoration Act (HFRA) (Section 303 of Public Law 108-148, December 3, 2003), and the Farm Bill: Food, Conservation, and Energy Act of 2008 (Public Law 110-234). There are no known or anticipated conflicts between federal, regional, state, local, or Indian reservation land use plans, policies, and controls for the TRRP project area at this time (40 CFR 1502.16(c)).

Contributors and Consultants

This chapter the lists the preparers and technical consultants to this draft EIS. Numerous other people have also contributed in many ways to this document. Their help is greatly appreciated.

Interdisciplinary Team

Marianne Emmendorfer – Interdisciplinary Team Leader, District Planner, Hume Lake Ranger District

Education: M.S. Recreation Management, University of Idaho; B.S. Forest Management, Michigan Technological University.

Experience: Marianne is currently the district planner, ecosystem management lead, and interpreter on the Hume Lake Ranger District of the Sequoia National Forest. She has 23 years of experience with the Forest Service including experience timber, silviculture, and resource management in Regions 1, 5 and 9.

Dave Ernst – District Fuels Officer

Education: B.A. Mathematics, California State University Northridge. Various agency provided training including: S-490 Advanced Fire Behavior Calculations, RX-310 Introduction to Fire Effects, and RX-341 Prescribe Fire Plan Preparation.

Experience: 20+ years of wildland firefighting with the Forest Service. Has been in current position since January 2012.

Fletcher Linton – Botanical Resources and Invasive Plants

Education: M.S. Soil Science emphasizing forest soil ecology, Washington State University, Pullman; B.S. Ecology and Systematic Biology, with a concentration in Ecology and Plant Systematics, California Polytechnic State University, San Luis Obispo.

Experience: Fletcher has been the forest botanist for 11 years. He worked for Bryce Canyon National Park as Park botanist. He has worked as a botanist, soil scientist, or ecologist on national forests in Washington, Colorado, and California. He also served as a natural resources volunteer with the Peace Corps in Bolivia for 2 years.

George Powell – Vegetation Management specialist and Giant Sequoia Ecology

Education: George was educated at Cal Poly San Luis Obispo, Colorado State University at Fort Collins, Utah State University at Logan, and Northern Arizona University in Flagstaff.

Experience: George has worked on the Sequoia National Forest for about 30 years. He has been a certified silviculturist for one half of that time, and Ecosystem Manager of the Western Divide Ranger District for one third of that time.

Jeff Cordes – Wildlife Biologist

Education: B.S. Wildlife Biology, Ohio University, Athens, Ohio.

Experience: Jeff has been a district wildlife biologist for 7 years on the Sequoia National Forest. He was a biologist with the National Park Service at Cape Lookout National Seashore for over 14 years.

Joe Loehner – District Natural Resource Specialist

Education: B.S. Biology, Chemistry Minor, California State University, Bakersfield.

Experience: Joe has served as the natural resource specialist for the Western Divide Ranger District since 2001 specializing in range, botany, noxious weeds, wildlife, and GIS. Joe had worked in the private sector in farming and ranching prior to his return to college and Forest Service career

Joshua Courter – District Hydrologist

Education: B.S. Geology, California State University, Bakersfield; Research and Educational Center for River Studies; Wildland Hydrology, Inc.

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Linn Gassaway – Cultural Resources, Tribal and Native American Interests

Education: M.A. Anthropology, San Francisco State University; B.A. Anthropology University of California, Berkeley.

Experience: Linn is currently the Giant Sequoia National Monument and North Zone Archaeologist for Sequoia National Forest covering Hume Lake and Western Divide Ranger Districts. She has 12 years working for the Forest Service on four forests in 4 regions. She has 7 years with the National Park Service, 1 year as an archaeologist with the Texas National Guard, and 2 years as an archaeologist for private cultural resources management companies.

Robin Galloway – District Wildlife Biologist

Education: B.S. Biology, California State University, Bakersfield.

Experience: Robin has been a wildlife biologist for Sequoia National Forest for 26 years specializing in Threatened, Endangered and Forest Service sensitive species management. Prior to her Forest Service career she worked for the California Department of Fish and Wildlife with the Little Kern golden trout project, and for Entrix a private consulting company.

Consultants

Emilie Lang – Forest Wildlife Biologist

Education: M.S. Natural Resources, Humboldt State University; B.S, Wildlife Management, Humboldt State University.

Experience: Emilie has been the Sequoia National Forest wildlife biologist for 5 years. She was a biologist with the naval base at Ventura County Point Mugu with the U.S. Navy for 6 years.

Glossary

Canopy base height is the average distance from the ground to the lowest portion (base) of the tree crown.

Canopy base height is the average distance from the ground to the lowest portion (base) of the tree crown.

Channel type is a way of classifying streams using various criteria including the geomorphology (such as channel pattern, sinuosity, slope, and stream bed materials), and the stream state (such as erosion potential, riparian vegetation, and whether it is in a stable state). The geomorphological characteristics are displayed in an alpha numeric code with the alphabetic portion based on the channel pattern, sinuosity and slope (A-F); and the numeric portion based on stream bed material (sand, cobble, boulder, etc.) (1-6).

Equivalent Roaded Acres (ERAs) is a standard factor used in the Sequoia National Forest Cumulative Watershed Effects Model, which assesses area compacted the associated recovery rate.

Hydrologic Unit Codes (HUCs) were designated by the United States Geological Service (USGS) in conjunction with other agency input.

Jackpot Burning is a type of controlled burn where the larger concentrations of slash or other down material, sometimes in piles, are ignited, and then the fire is allowed to work its way through the surface fuels and creep through the unit.

MIS Category 3 is a determination made using the Sierra Nevada Forests MIS Amendment Record of Decision (SNF MIS Amendment) (USDA 2007) to distinguish MIS whose habitat would be either directly or indirectly affected by the project, from MIS with no habitat in the area (Category 1), or whose habitat, though in the area, would not be directly or indirectly affected by the project (Category 2).

Threshold of Concern (TOC) is expressed as a percentage (percent of ERAs used) and represents the potential risk to the subwatershed from erosion or compaction, as it approaches and exceeds its threshold.

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Appendix A-Fuel Load Reduction Plan for the Black Mountain Grove

Fuel Load Reduction Plan

for the

Black Mountain Giant Sequoia Grove

Western Divide Ranger District

Sequoia National Forest and Giant Sequoia National Monument

September 11, 2013

Prepared by: ____________ Date: 9/11/13
David Ernst
Fuels Specialist

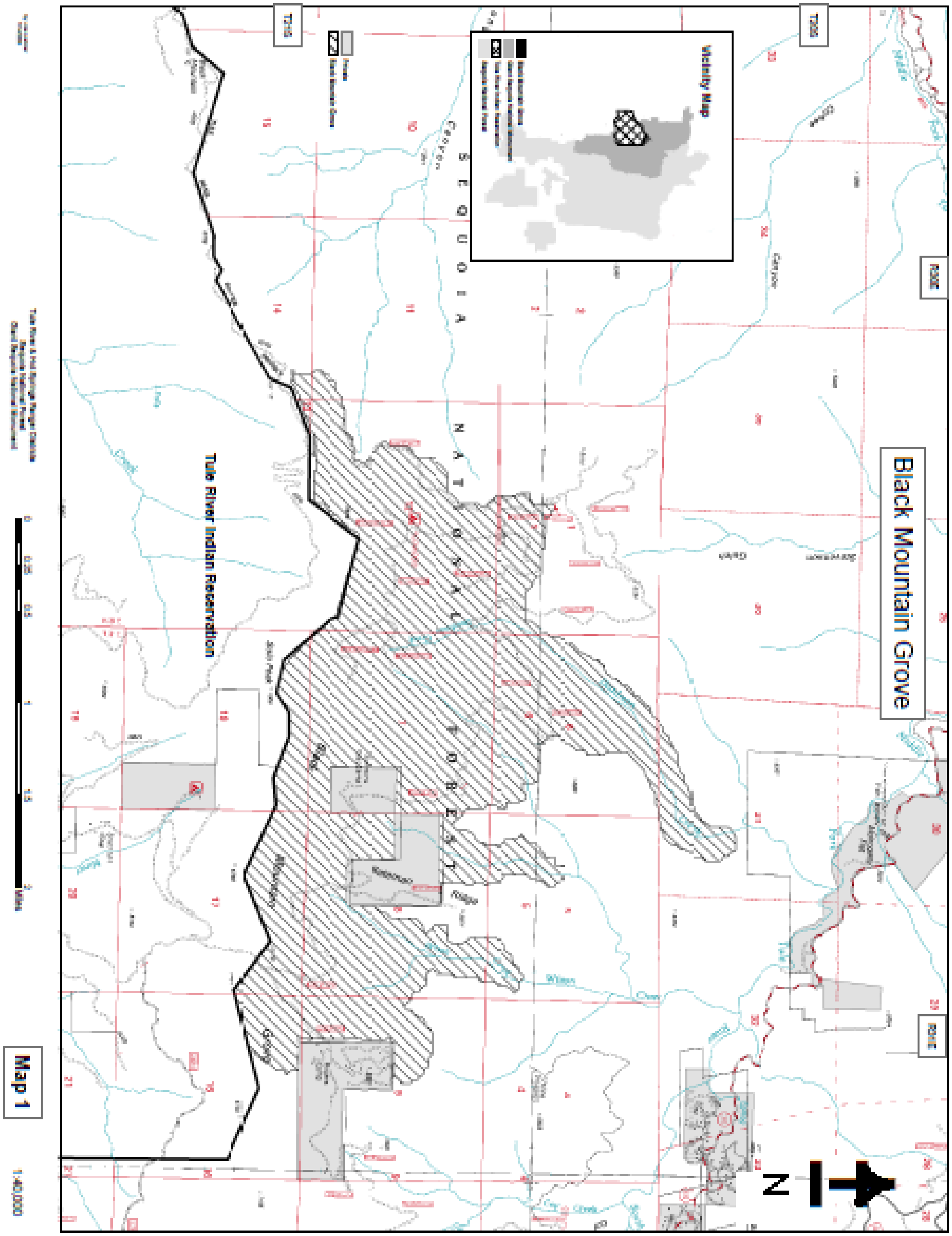
Approved by: ____________ Date: 9/11/13
Richard Stevens
District Ranger

1

Contents

Photo on front cover: Black Mountain Giant Sequoia Grove.

Map 1: Black Mountain Giant Sequoia Grove



INTRODUCTION

To begin the process of restoring the giant sequoia groves and their ecosystems, the Forest Service is preparing fuel load reduction plans for the groves. The purpose of this plan is to provide an overview of the fire history, assess current fuel conditions, and identify changes that need to be made to improve the overall fuel conditions in the Black Mountain Giant Sequoia Grove.

The 1990 Mediated Settlement Agreement (MSA) and the proclamation establishing the Giant Sequoia National Monument (Monument) both recognized the need for fuels reduction treatments in the Monument and, in particular, in the giant sequoia groves. The MSA directed that the groves be inventoried and evaluated for their fuel load build-up:

> *Based on this inventory and evaluation, groves, or parts of groves, with risks to catastrophic fire and/or exclusion of new giant sequoia regeneration because of natural fuel load build-up will be identified and prioritized for fuel load reduction treatment*.

The Proclamation establishing the Giant Sequoia National Monument (Clinton Proclamation 2000) states the following regarding fuel build-up and giant sequoia reproduction:

> *…a century of fire suppression has led to an unprecedented failure in sequoia reproduction in otherwise undisturbed groves. These forests need restoration to counteract the effects of a century of fire suppression and logging. Fire suppression has caused forests to become denser in many areas, with increased dominance of shade-tolerant species. Woody debris has accumulated, causing an unprecedented build-up of surface fuels. One of the most immediate consequences of these changes is an increased hazard of wildfires of a severity that was rarely encountered in pre-Euroamerican times (Clinton 2000, p. 24095).*

The 2012 Giant Sequoia National Monument Management Plan (Monument Plan) includes management direction to develop a fuel load reduction plan for each giant sequoia grove in the Monument, using the most recent inventories of fuel load, in order to identify and prioritize groves or parts of groves and their surrounding watersheds for fuel reduction treatments (Monument Plan, Part 2-Strategy, pp. 50-51).

This document describes the existing conditions and need for treatments within the majority of the Black Mountain Giant Sequoia Grove that lies within the Giant Sequoia National Monument (Monument) of the Sequoia National Forest (Map 1). Approximately 2,615 acres of the grove are in the Monument, while the remainder is located in the Tule River Indian Reservation and on private property.

BACKGROUND AND DISTURBANCE HISTORY

Giant sequoias are the largest trees on the planet and are among the oldest, sometimes living for 3,200 years or more. Sequoia groves are part of the Sierra Nevada mixed conifer forest that contains giant sequoias. Groves contain a mix of tree species in which giant sequoias are a numerically minor, but visually striking, component. Numerically, most groves are overwhelmingly dominated by white fir, with sugar pine commonly being the next most abundant species, followed by giant sequoia. Black oak, ponderosa pine, incense-cedar, Jeffrey pine, and red fir are often additional grove components (Stephenson 1996).

For at least the two or three millennia preceding Euroamerican settlement, predominantly low-moderate intensity surface fires burned within individual sequoia groves on the order of every 2 to 10 years (Kilgore and Taylor 1979, Swetnam et al. 1992, Swetnam 1993). Because of the loss of Native American ignitions, and suppression of lightning ignitions that followed Euroamerican settlement, most grove areas today have experienced a 100- to 130-year period without significant fire (Stephenson 1996). This lack of fire has caused important changes in grove conditions. Giant sequoia reproduction, which in the past depended on frequent fires, has effectively ceased in many groves, and reproduction of other shade-intolerant species has been reduced. Most significantly, dead material has accumulated, causing an unprecedented buildup of surface fuels. Additionally, ladder fuels, capable of carrying fire into the crowns of mature trees, have increased. One of the most immediate consequences of higher levels of fuels is an increased hazard of wildfires sweeping through groves with a severity rarely encountered before Euroamerican settlement (Stephenson 1996).

Some logging of giant sequoias in the Sierra Nevada mountain range began in 1856 on lands later designated as national forest. Logging has continued intermittently to this day on nonfederal lands in the vicinity of the Monument. Early entrepreneurs, seeing profit in the gigantic trees, began acquiring lands within the present-day Monument under the Timber and Stone Act in the 1880s.

The heaviest logging of sequoia groves occurred between 1880 and 1920. Nearly all pines and many firs were removed from several groves. Today, these logged groves have regenerated as complex mosaics of forest, with patches of differing structure (tree diameter, height, and density) and species composition (Stephenson 1996).

Past Management History

A brief account of the history of Black Mountain Grove is discussed in Dwight Willard's "Giant Sequoia Groves of the Sierra Nevada (Willard 1994). The grove has a complicated land ownership history. From an early date, large areas of the grove were privately owned, or were included in the Tule River Indian Reservation. Some of this land was heavily logged for giant sequoias and other timber, while much of it remained pristine until 1960. Most of the grove in the Monument escaped significant pre-1950 logging. Meyer (1952) reported that almost all of the then Sequoia National Forest grove land still had little or no logging. Some areas in this part of the grove were partially cut in the 1950s. The 1964 to 1965 Solo Peak Timber Sale selectively harvested an unknown volume of non-sequoia conifers, reportedly by individual tree selection methods, on 116 acres. The early 1970s Black Mountain Sale apparently focused on the western side of the grove. Some of the grove was cut over before the Sequoia National Forest acquired it from private landowners in the 1975 Crawford Exchange. That area included land adjacent to Rogers Camp, as well as 120 acres near the Simmons Post Camp site.

Regeneration harvesting in the 1980s, mostly in the western part of the grove, created 11 plantations covering about 258 acres. Non-sequoia "whitewoods" were harvested with the objective of obtaining giant sequoia regeneration, which was not happening naturally because of the dense, crowded stands and closed canopy. All large giant sequoia trees were protected during these harvests, except for the few that were removed during road construction.

Fire History

Fire history information for the giant sequoia groves is available back to 1910 and there are areas within the Black Mountain Grove that have no record of fire occurrence. Since formal fire records have been kept, only six fires larger than ten acres have burned inside the grove boundary in the Monument (see Table 1 and Map 2).

Table 64. Fire History in the Black Mountain Giant Sequoia Grove

Fire Year	Cause	Total Fire Size in Acres	Acres of Fire in Grove
1914	Campfire	362	362
1926	Lightning	158	34
1926	Lightning	27	27
1928	Campfire	3,181	1277
1949	Campfire	10	10
2008	Human	272	237

Only fires $\geq$ 10 acres shown

The potential exists for large fires to threaten the Black Mountain Grove if fires come upslope from Long Canyon or the Middle Fork drainage of the Tule River (see Map 1). There is also the potential for large fires that originate on the Tule River Indian Reservation, in the South Fork drainage of the Tule River, to threaten the grove. Due to the high fuel load and the amount of time that has passed since the last known fires, it is believed that if a fire is established and spreads up the steep slopes and into the grove it will be a stand-replacing fire. Such a fire would threaten large giant sequoias, degrade water quality, and damage other resources.

In the last 20 years, 35 of the 146 fires (or 24%) in this part of the Monument have started down slope of the Black Mountain Grove to the north or northwest, with the majority starting near Upper and Lower Coffee Camp Day Use Areas and along Highway

190 (see Map 2). Fires that start in lower Long Canyon are a concern for the Tule River Tribe. This canyon, located between the lower Tule River and Black Mountain Grove, is a path that fire can follow from the lower slopes south of Coffee Camp, through the grove, and onto Tribal lands (see Map 1). From 1910 to 1999, 103 of 146, or 70.5%, of fires on the Tule River Reservation started down slope of the Black Mountain Grove in the South Fork of the Tule River. One notable fire, the Chololllo Fire, came within ½ mile of the Black Mountain Grove in 1996.

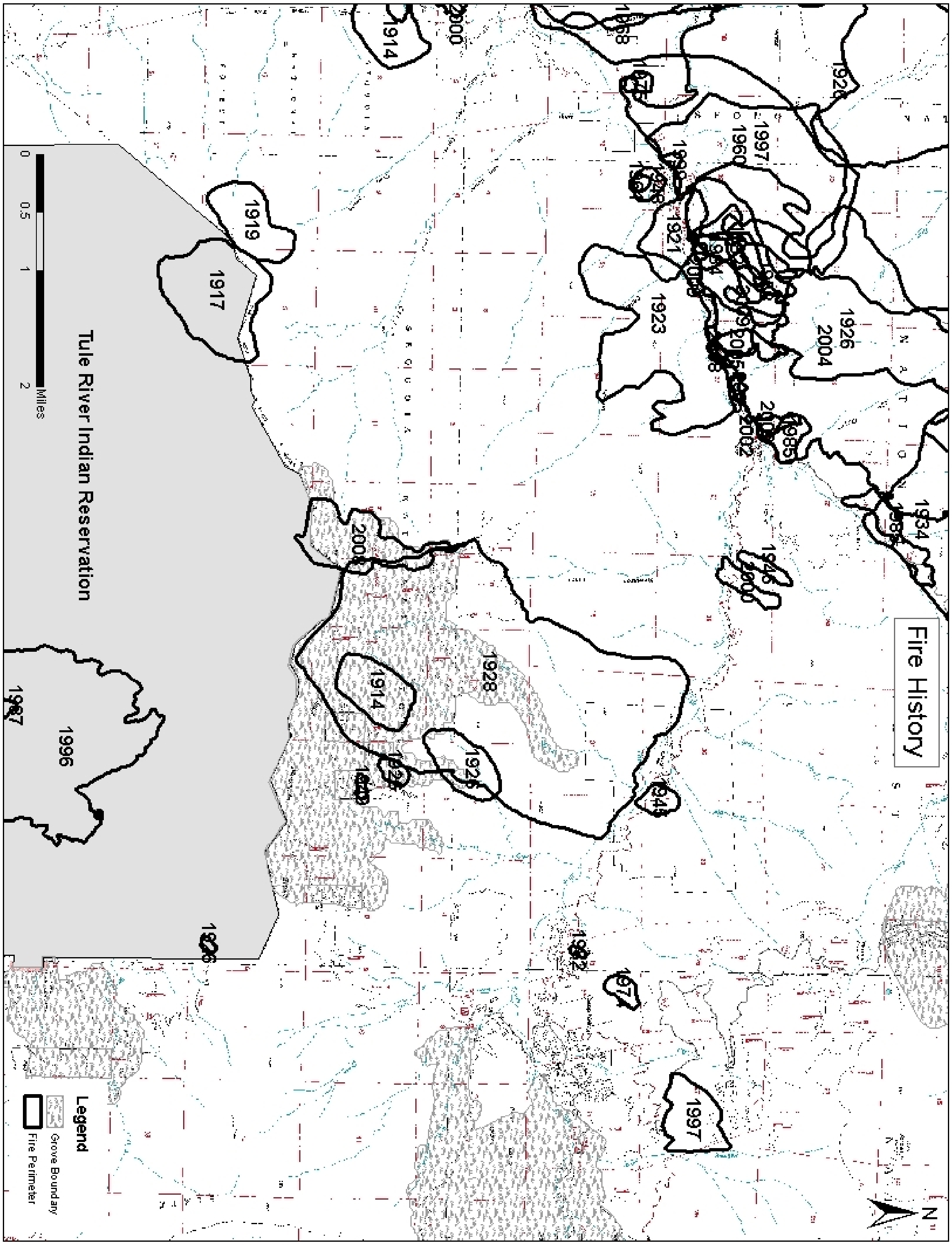
EXISTING CONDITION

The Black Mountain Giant Sequoia Grove spans portions of the Tule River Indian Reservation and the Monument. The majority of the grove, approximately 2,615 acres, is within the Monument and part of the Sequoia National Forest. The remaining 205 acres are in the Tule River Indian Reservation and on private property inholdings in the Monument.

The historic fire return interval for giant sequoia groves is as low as three to eight years, with a mean average of 15 to 18 years, depending on the aspect of the slope (Kilgore and Taylor 1979). The last fire 10 acres or larger was 64 years ago. The accumulation of woody debris has led to an unnaturally high level of surface fuels in the majority of this grove. Natural reproduction of shade-tolerant species such as white fir and incense cedar has also created fuel ladders that could take fire up to the overstory.

Under extreme weather conditions, the combination of topography, vegetation, and fuel loading in and around the grove is such that a wildfire could not be safely suppressed. Once a fire is established, a crown fire would likely initiate and spread. Such a fire would not only be a threat to Monument objects of interest, including giant sequoia trees, wildlife habitat, and cultural sites, but also to life, property, and other resources in the area. The primary resource concern is mortality of giant sequoia trees, especially the large specimen trees. Other threatened resources are water quality, dispersed recreation sites, adjacent private property, and the Tule River Indian Reservation. Stand-replacing fire would threaten life and property in the Tule River Indian Reservation and the community of Rogers Camp. The Tule River Tribal Council has identified the reservation as a community at risk through the California Fire Alliance.

Map 2: Fire History in the Black Mountain Giant Sequoia Grove



The part of the Black Mountain Grove in the Monument has primarily a northern aspect. The elevation ranges from 5,000 to 7,300 feet. The average annual precipitation in the grove is about 35 inches, mostly occurring as snow during the winter months.

Fire Return Interval Departure (FRID)

Fire return interval describes how often fires occur in a particular location. This is a temporal attribute of the fire regime that is measurable by determining when fire occurred last on each of the acres in the area and comparing this with the historic interval between fires for the vegetation type. Fire return interval is an indicator of how close the area is to the historic fire regime. Some attributes of the fire regime that are difficult to manage by simply putting fire back into the ecosystem are: seasonality, severity, intensity, fire type, and complexity.

The fire return interval for a given vegetation type can be used in conjunction with fire history maps to determine which areas have missed natural fires. This information is known as the fire return interval departure (FRID), as shown in Table 2. A fire return interval departure map was developed by Sequoia and Kings Canyon National Parks from vegetation, fire history, and historic fire frequency data to assess the departures from the historical fire return interval in areas within the Monument. A fire return interval departure index was reclassified into five categories: extreme, high, moderate, low, and rock/water.

Fire history maps show that the earliest fire within the Black Mountain Grove occurred in 1914, and that the last fire larger than 10 acres occurred in 1928, over 85 years ago. Based on the mean historic fire return interval of 15 to 18 years for giant sequoia groves (Kilgore and Taylor 1979), the fire return interval for this grove has been missed more than four times in the majority of the grove.

Fire regime condition class (FRCC) is a classification of the amount of departure from the natural regime. The classification is based on the average number of years between fires (fire frequency) and the expected severity of effects from fire on vegetation and fuels. Areas that have missed one to two fire return intervals are considered in Fire Regime Condition Class (FRCC) 1; those missing two to five fire return intervals are considered FRCC 2, and those with more than five fire return intervals missed are considered FRCC 3. The departure from the fire return intervals is interpreted as moderate, high, and extreme for FRCC 1, 2, and 3, respectively. Approximately 97% of the Black Mountain Grove is in FRCC 2 or 3, with approximately 49% in FRCC 3 (see Table 2, Maps 2 and 3). These acres are derived from the Sequoia National Forest’s Fire Return Interval Departure (FRID) GIS layer.

Map 3: Fire Regime Condition Class (FRCC) in Black Mountain Giant Sequoia Grove

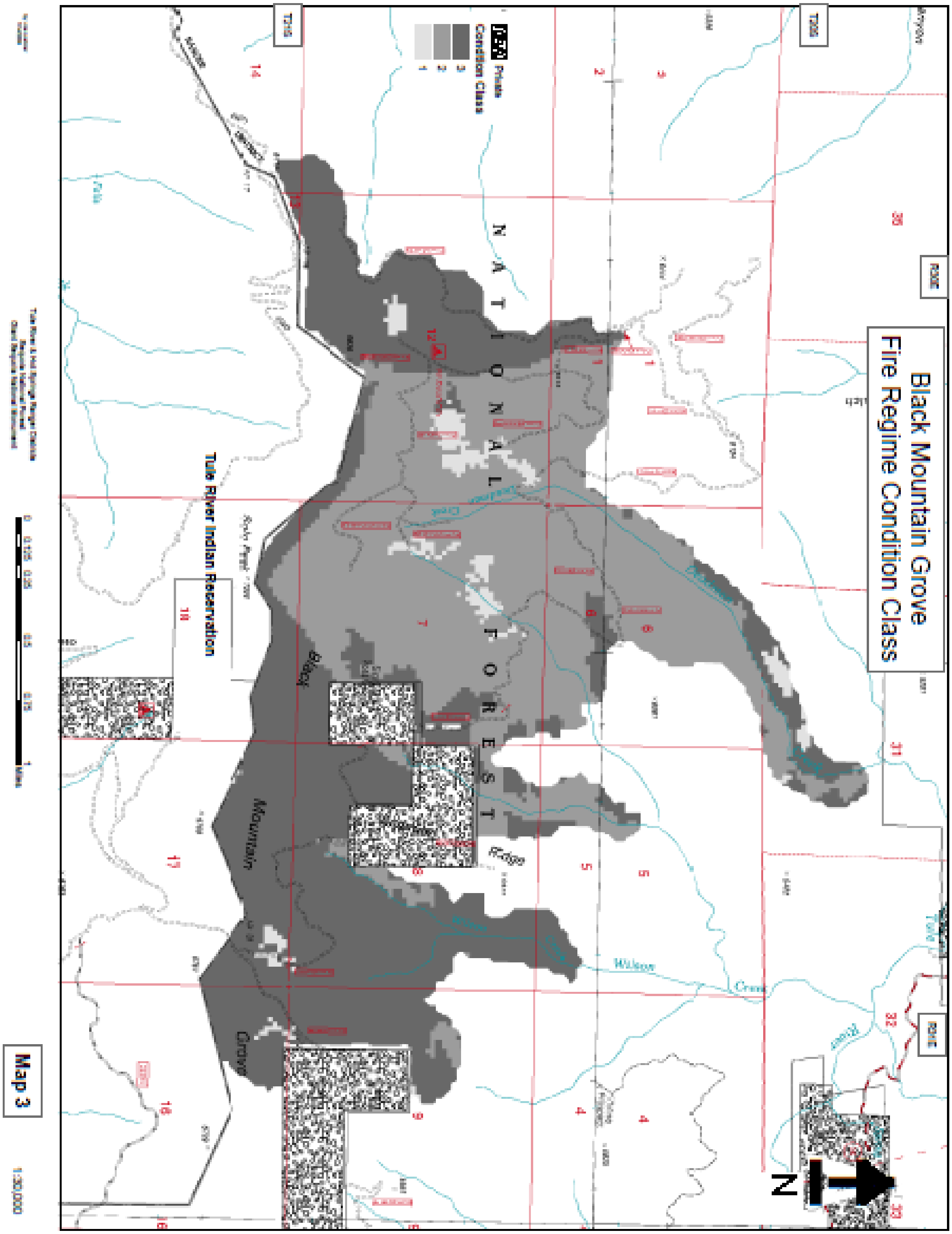


Table 65. Fire Return Interval Departure (FRID) and Fire Regime Condition Class (FRCC) in Black Mountain Grove

Fire Return Interval Departure (FRID)	FRID Rating	Acres	Fire Regime Condition Class (FRCC)
5 - 17 intervals missed	Extreme	1,249	3
2 - 4.9 intervals missed	High	1,220	2
0 - 1.9 intervals missed	Moderate	76	1
Total		**2,545**	

A mean fire return interval frequency as low as three to eight years has been recorded in giant sequoia groves in the Sierra Nevada Mountains (Swetnam et al. 1992, Swetnam 1993). Of the 2,545 acres inside the grove boundary, only about 1,690 acres have burned in the last 94 years. Some of these acres have burned more than once because of overlapping fire perimeters (see Map 2). This is an average of 18 acres per year burned by fire for this period of time.

Fire Behavior

Fuel models were determined using forest and Monument Geographic Information Systems (GIS) layers, satellite imagery, plot data from the Black Mountain Giant Sequoia Grove Inventory, aerial photos (PSW-GTR-163), and personal observations (see Map 4). The BEHAVE fire behavior prediction model was run using 20 years of data from remote automated weather stations (RAWS), in order to project the flame lengths and potential rates of spread of a wildfire under 90th percentile weather conditions. Fireline production rates for crews are presented in the 2004 Fireline Handbook, Appendix A, page A-30. A four-foot flame length is considered the maximum that can be attacked by hand crews to create fire lines near a wild fire. The amount of heat is measured in BTU’s (British Thermal Units). The amount of BTU’s created by fires limit the distance firefighters can be near a fire. In addition, the greater the amount of fuel, the greater effort and time required for fireline production. As shown in Table 3, the production rates are less than 10 chains per hour for more than half of the grove.

Map 4: Fuel Models for the Black Mountain Giant Sequoia Grove

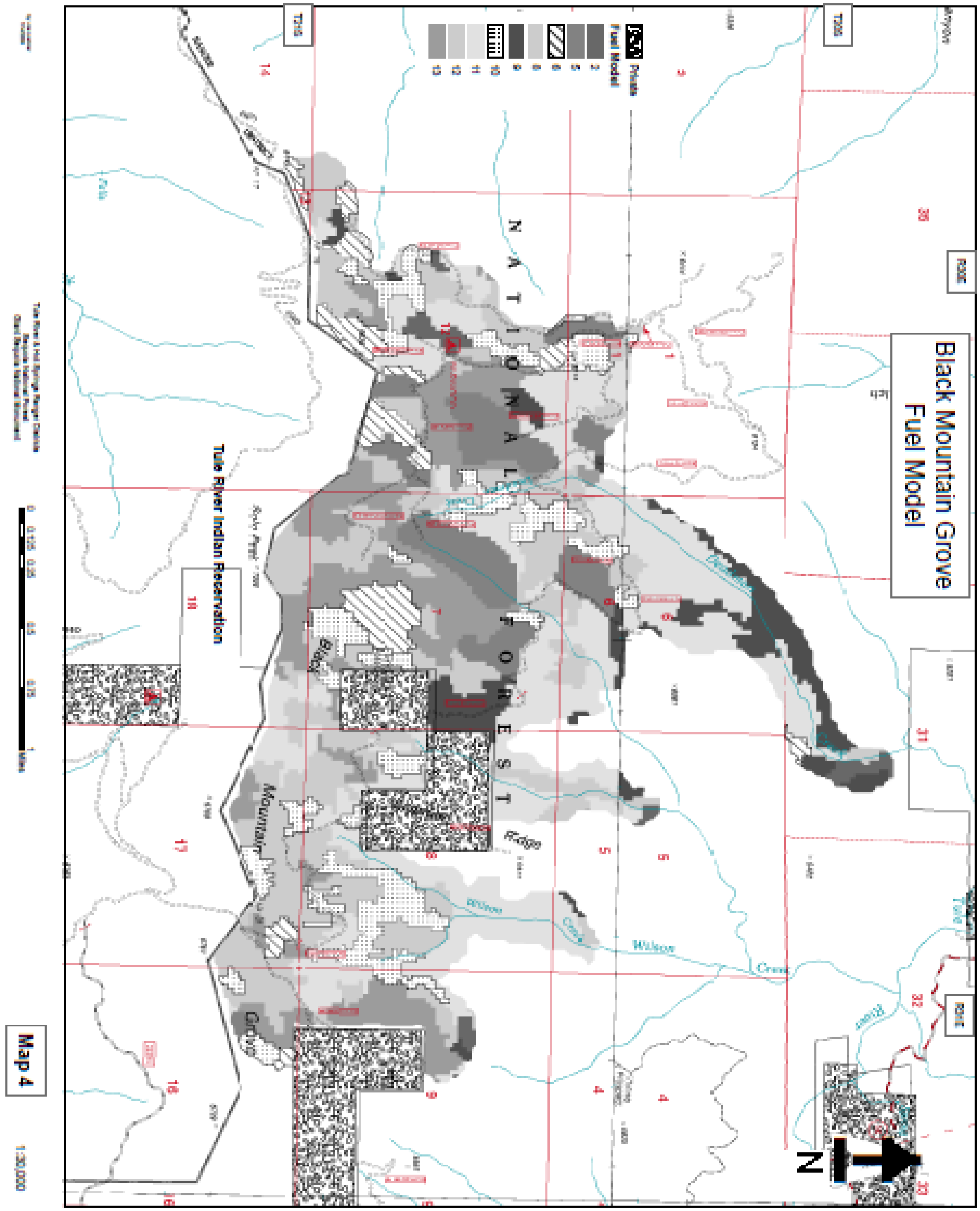


Table 3. Acres, Expected Flame Length, and Rate of Spread for Fuel Models

Fuel Model	Acres	Expected Flame Length (ft)	Expected Rate of Spread (chains*/hour)
Fuel Model 2 Open Pine w/ Grass	36	5.4	24
Fuel Model 5 Shrubs	214	6.3	6
Fuel Model 6 Chaparral	133	4.9	6
Fuel Model 8 Short-needle Conifers	7	0.9	7-40
Fuel Model 9 Pines and Hardwoods	165	2.3	28-40
Fuel Model 10 Mixed Conifer Stands	276	5.2	6
Fuel Model 11 Mixed Conifer w/ light surface fuels	723	3.1	15
Fuel Model 12 Mixed Conifer w/ medium surface fuels	636	7.3	7
Fuel Model 13 Mixed Conifer w/ heavy surface fuels	355	9.5	5
Total Acres	**2,545**		

* One chain equals 66 feet

Vegetation and Fuel Loading

Based on sample plot data collected in the Black Mountain Grove in 2003, the surface fuel loading in the grove is approximately 91 tons per acre (see Table 4). The fuel loading in 2013 is likely greater because no fires or fuel reduction activities have occurred since 2003, allowing an increase in fuels from both plant growth and natural tree mortality.

Table 66. Current and Desired Fuel Loading

Fuel Size Class (inches)	Current Fuel Loading (tons per acre)	Desired Fuel Loading (tons per acre)
Duff	30	5-15
0-1”	3	1-2
1-3”	4	1-3
3-9”	5	1-3
Greater than 9”	49	10-20
Total	**91**	**18-43**

Tree Density

Jump (2004) states that the inventory of the Black Mountain Grove shows that the grove is in a generally declining condition. The high tree density has been causing mortality in white fir and sugar pine over the past 40 to 50 years, as indicated by the excessive numbers of snags and down logs in the grove (Jump 2004). Giant sequoia trees average only 4% of the trees per acre, which is significantly below the desired number of sequoias (10% of trees per acre) needed to sustain the stand. Extensive canopy cover of shrubs, white fir, and hardwoods indicate that fuel loading is in excess of desired levels, and that the grove is at risk from destructive wildfire (Jump 2004, page 2) (see Table 5).

Table 67. Trees and Seedlings per Acre by Tree Species[10]

Tree Species	% of Trees/ Acre	# of Seedlings/ Acre
Giant sequoia	4	0
Ponderosa pine	4	10
Sugar pine	12	20
White fir	52	151
Incense cedar	17	55
Black oak	Not shown	31
Nutmeg	Not shown	6
Pacific dogwood	Not shown	55
TOTAL	**89**	**328**

[10] From Jump 2004: Table 1. Species Composition, and Table 3. Seedlings per acre.

Table 68. Conifer Trees per Acre and Basal Area per Acre by Diameter Class[11]

Diameter Class (inches DBH)	Basal Area/ Acre (sq. ft.)	Trees/ Acre
1-4	6	133
5-10	39	90
11-14	31	31
15-20	52	38
21-28	64	30
29-38	58	20
39+	142	14
TOTAL	**392**	**356**

Based on Table 5 and Table 6, giant sequoia regeneration is lacking overall and shade-tolerant species (white fir) have increased. Trees less than 12 inches in diameter are dominating much of the grove and make up the ladder fuels that lower the canopy base height in wildfire situations.

Other Resource Conditions

Wildlife

The Proclamation creating the Monument and the Monument Plan identify the diverse array of rare animal species as objects of interest and direct the protection, proper care, and management of their essential habitat features. The Black Mountain Grove currently provides suitable habitat for a number of sensitive wildlife species, including Pacific fishers and California spotted owls. The grove contains a spotted owl Protected Activity Center (PAC) based on historic detections of these birds nesting in the grove.

Hydrology

The existing conditions of hydrological resources will be evaluated at a watershed or sub-watershed scale in site-specific project planning.

Cultural Resources

The Proclamation creating the Monument and the Monument Plan identify cultural resources, both historic and prehistoric, as objects of interest in the Monument. Prehistoric archaeological sites such as lithic scatters, food-processing sites, and village sites are found in the Black Mountain Grove area. These sites have the potential to shed light on the roles of prehistoric peoples, including the role they played in shaping the ecosystems on which they depended. Historic sites in and around Black Mountain Grove

[2]Table 2 from Jump, 2004. Grove Density and Tree Stocking by Diameter Class (conifers).

can provide an opportunity to study historic logging operations and historic land management.

Recreation

The Monument Plan provides for and encourages continued public and recreation access and use consistent with protecting the objects of interest. There is dispersed camping in the Black Mountain Grove area.

FUEL TREATMENT GOALS

This fuel load reduction plan provides an assessment of the current fuel conditions in Black Mountain Giant Sequoia Grove based on the fire and management history of the grove. Conditions vary in terms of fuel loading, type and density of vegetation, fire history, and topography.

Fuel treatment goals for the Black Mountain Giant Sequoia Grove have been identified in compliance with the 2012 Giant Sequoia National Monument Management Plan (Monument Plan). Fuel treatment goals identified at this time include:

- Maintain lower, manageable levels of surface and ladder fuels to reduce the risk of uncharacteristic stand-replacing fires.
    - Reduce fuels along property boundaries, roads, and ridgelines, to reduce the risk of fire spreading from or into private land.
    - Reduce fuel loading and continuity along the boundary with the Tule River Indian Reservation (TRIR) to reduce the risk of fire spreading across the boundary. As conditions allow, conduct joint fire treatments with TRIR.

- Restore fuel conditions such that an average live crown base tree height of 20 feet and average flame lengths of six feet or less can be maintained should a wildfire occur under 90^{th} percentile fire weather conditions.

- During fuel load reduction activities, emphasize the protection of large giant sequoia trees and large trees of other species including pines.
    - Reduce the number of shade-tolerant trees that act as ladder fuels in order to protect large giant sequoias, and to encourage regeneration and growth of fire-adapted giant sequoia and pine species.

Photos

Picture 35. View from Long Canyon looking down slope from Forest Road 21S94.

Picture 36. View from Stevenson's Gulch below the Black Mountain Grove (photo taken from Highway 190). The steep slopes are covered with heavy fuels and limited opportunities to safely suppress a fire. A fire starting at the river would likely go up to the ridge top and into the Black Mountain Grove.

Picture 3. Plantation in the Black Mountain Grove. Plantations such as this one in the Black Mountain Grove were created in the 1980's have since become thick with brush, young giant sequoia trees, ponderosa pine, Jeffrey pine, and incense cedar trees.

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Appendix B-Management Tool Determination and Clear Need Determination for Tree Felling for the Tule River Reservation Protection Project

Management Tool Determination

The decision tree presented in the Giant Sequoia National Monument Management Plan (Monument Plan, pp. 80-82) was used to determine which methods of forest restoration and maintenance to use in the Tule River Reservation Protection Project. The risks, feasibility, and effectiveness of managed wildfire, prescribed burning, mechanical treatments without tree removal, and mechanical treatments with tree removal, or a combination of two or more of these management tools were assessed.

The risk assessment considered local conditions such as slope, fuel loadings, and proximity to communities, giant sequoia groves, fisher den sites, and nest trees. The Tule River Reservation Protection (TRRP) Project lies within the Black Mountain Grove. Using the most recent inventories of fuel load, a fuel load reduction plan was completed for this grove (see Appendix A).

Purpose and Need

The purpose of TRRP Project is to respond to the Tule River Tribal Council's request for action under the 2004 Tribal Forest Protection Act, and to protect, restore, and maintain the Black Mountain Giant Sequoia Grove, the surrounding forest, and the other objects of interest in the project area, by conducting fuels management activities in the Tribal Fuels Emphasis Treatment Area (TFETA) defined in the Giant Sequoia National Monument Management Plan (Monument Plan). The TFETA was designed along the boundary with the Tule River Indian Reservation to not only protect the reservation and its watersheds, but also the objects of interest and watersheds in the Monument, from fires spreading from one to the other.

The need for this project is to reduce the accumulation of woody fuels adjacent to the reservation in order to:

- Prevent unwanted wildland fire from spreading onto the Tule River Indian Reservation (Reservation) from the project area.
- Move the project area toward the desired conditions in the Monument Plan for Fire and Fuels in the TFETA.

1. Use Managed Wildfire

Risks and complexities for naturally-ignited wildfires were analyzed to determine if they could be successfully managed for ecological benefit and to meet the purpose and need for the TRRP Project. If a wildfire does occur, the risks and effectiveness of managing it will be weighed using the Wildland Fire Decision Support System (WFDSS). Managed wildfire in the TRRP Project area is likely to meet the purpose and need of the project to reduce fuels to protect, restore, and maintain the objects of interest only under low fire intensity conditions, or if the fire were to start near the top of the project area. A fire starting in high intensity fire conditions or lower in the project area would likely not meet objectives because the risk of a stand-replacing fire burning into the Reservation or across private property would be very high. Managed wildfire will be considered throughout the project area if a naturally-ignited wildfire becomes available. Managed wildfires will use strategies and tactics which provide for the protection of human health, safety, and natural and cultural resource values.

2. Use Prescribed Burning

A risk assessment was conducted of local conditions such as slope, fuel loadings, and proximity to communities, giant sequoia groves, fisher den sites, and nest trees. The use of prescribed burning would not pose unacceptable risk to the objects of interest, forest users, the Tule River Indian Reservation or nearby private properties. Mitigation measures to reduce potential risk will include hand treatments (i.e., clearing fuels by hand, using backing fire and similar lighting techniques) around giant sequoias, cultural resources, and other objects of interest.

Prescribed burning would be effective in meeting ecological restoration strategies and objectives; and helping to protect the Reservation, the objects of interest, and nearby private property. Prescribed fire is likely to meet the purpose and need of the project to reduce fuels, prevent unwanted wildland fire from spreading, and meet the desired conditions for fire and fuels in the Monument Plan. Prescribed burning can be timed to improve the ecological condition of the giant sequoia groves, their ecosystems, and wildlife habitat in the project area, while minimizing the potential for negative effects on cultural resources and the nearby private properties or the Reservation.

Considering factors such as the availability of personnel and favorable burn days indicate that prescribed burning would be feasible. Preparation and burning would incur a moderate cost per acre over the entire project area. Some portions could be more costly in personnel time, especially where hand treatments are needed prior to burning.

3. Use Mechanical Means without Tree Removal

Prescribed burning alone (or in addition to managed wildfire if it becomes available) does not pose unacceptable risk, and is considered effective and feasible to meet the purpose and need in the project area. Preparatory treatments necessary to ensure firefighter safety and that prescribed fires do not escape will include the felling of smaller trees that would serve as ladder fuels, but will not make use of heavy equipment, because much of the terrain in the project area is too steep for machinery. Since these activities would not make use of heavy machinery, these are not considered mechanical treatments and additional assessment was not needed to evaluate them.

4. Use Mechanical Means with Tree Removal

Prescribed burning alone (or in addition to managed wildfire if it becomes available) does not pose unacceptable risk, and is considered effective and feasible to meet the purpose and need in the project area. Therefore, additional assessment was not needed to evaluate mechanical treatments with tree removal.

Conclusion

Managed wildfire may be used if it becomes available. Prescribed fire, and piling and burning will be the primary methods of treatment for reducing fuels and preventing the spread of unwanted wildland fire. Prescribed fire, as well as the preparatory treatments necessary to make it as safe as possible, and piling and burning is proposed to begin restoring ecological conditions in this portion of the Tule River Drainage in the Western Divide Ranger District of the Giant Sequoia National Monument and the Sequoia National Forest.

Tree Felling Criteria

The TRRP Project reduces fuels in and re-introduces fire to Monument ecosystems with prescribed burning. During implementation of the TRRP Project, it is likely that trees will need to be felled to reduce excessive fuels, to avoid unacceptable tree mortality, to reduce the risk of crown fire, to reduce safety hazards to firefighters, and to protect some of the Monument objects of interest.

> Any projects which propose the felling of trees inside the Monument will be subject to the following five criteria (numbered F1 through F5) for tree felling. These five criteria shall apply to any treatments which involve the felling of trees…(Monument Plan, page 79).

F1. Resiliency: If maintaining one or more standing trees on a site would deplete moisture, light, or nutritional resources critical to the health and survival of the plant community or forest.

- The competition for soil moisture, sunlight, and nutrients in the 400 acres of planted stands in the TRRP project area has resulted in declining tree growth rates and a shift in species composition. Thinning, limbing, and reducing the ground fuels in these stands will promote forest health and resiliency in these stands by increasing the water, light, and nutrients available to the residual trees and reducing the risk of mortality from crown fires and other forest stressors.

F2. Regeneration: If maintaining one or more standing trees on a site would adversely affect the regeneration, longevity, or growth of giant sequoias and other desired species.

- Suppressed understory trees may need to be felled and other heavy fuels removed prior to prescribed burning, which is expected to encourage giant sequoia regeneration.
- There may be trees that serve as ladder fuels that need to be felled and moved away from the base of trees to protect giant sequoias from crown fires (Monument Plan, page 45, Strategy #s 6 and 9).
- Reducing the number of shade-tolerant trees that act as ladder fuels in planted stands would help protect large giant sequoias, increase the proportion of giant sequoias and other desired species, and encourage regeneration and growth of fire-adapted giant sequoias and pine species.

F3. Heterogeneity: If maintaining one or more standing trees on a site would adversely affect the desired diversity or structure of a stand or forest.

- Thinning in the planted stands in the TRRP project area would improve heterogeneity by encouraging more diversity in species composition and age, reducing stand density, and encouraging shade-intolerant species.

F4. Public Safety: If maintaining one or more standing trees on site would create a public safety hazard. Forest Service policy is to mitigate safety hazards from recreation sites, administrative sites, and the public transportation system of roads and trails, including trees or tree limbs identified as hazardous (FSM 2330.6a).

- There may be some trees that are safety hazards to firefighters along proposed firelines, roads and trails in the TRRP project area that need to be felled before they can conduct treatments in those areas.
- Mortality may occur in some trees after prescribed burning operations are complete. Trees which pose a hazard to firefighters working to repair any damage to trails or roads will need to be felled.

F5. Recreation and Administrative Sites: Other projects that may be proposed in the Monument that could require tree felling include recreation or administrative site development and maintenance, scenic vistas, and road access and parking for these sites.

- Mortality may occur in some trees after prescribed burning operations are complete. There may be trees that need to be felled because they present a hazard to Monument objects of interest such as cultural resource sites, recreation sites, or wildlife trees.

Appendix C-Management Requirements and Constraints

The items listed below were determined by the ID team to be actions necessary to carry the results of their analysis into the design phase of the Tule River Reservation Protection Project planning. Implementation of best management practices (BMPs) is mandatory even though they may not necessarily be required to avoid unacceptable environmental effects.

Specialty	Action or Constraint	Responsibility and When to Accomplish	How and When Accomplished[12]
Fuels/Air	A smoke management plan must be submitted and approved by the San Joaquin Valley Air Pollution Control District (District) prior to the project. As part of the plan the Forest Service must provide a detailed meteorological prescription that must be met prior to igniting any of the burning operations. At a minimum the prescription must include acceptable wind direction. Other considerations include wind speed, temperature profile, winds aloft, humidity, temperature, actual and predicted inversions, burn day status and forecast, precipitation forecast, and any other meteorological conditions which may affect smoke dispersion and/or fire behavior. The plan must also contain contingency measures in the event smoke impacts smoke sensitive areas. Smoke sensitive areas must be delineated in the plan.	Fuels officer; During design and implementation.	
	The Sequoia National Forest operates a comprehensive air quality and smoke monitoring program. The program emphasizes instrumentation that provides near real-time data for fine particles, ozone and meteorology. Instrumentation would be placed at smoke sensitive areas and would be used to coordinate with the District and the Great Basin Unified Air Pollution Control District. Information would be coordinated to assist in mitigating public exposure. In addition, an Air Quality Specialist would be assigned to provide smoke forecasts utilizing the monitoring data and predictive models.	Air quality specialist; During design and implementation.	
	Prescribed fire operation plans would follow San Joaquin Valley Air Pollution Control District guidelines.	Fuels officer; During design and implementation.	
	Prior to implementing fire operations, public notification aimed at sensitive individuals and groups would be conducted in both the San Joaquin and Great Basin Air Districts.	Fuels officer and Public Affairs officer; Prior to and during implementation.	

[12] This section can be brought forward into a contract, and would be filled in as the project is implemented.

	Heavy accumulations of fuel will be strategically pulled back from large giant sequoia trees to prevent mortality from prescribed burning	Fuels officer and ecosystem mgt. staff; During implementation	
Cultural Resources	**Protect all "At-Risk Historic Properties"**: During construction of fire breaks, fuel treatments, and understory burning: 11. Proposed undertakings shall avoid historic properties. Avoidance means that no activities associated with undertakings that may affect historic properties, unless specifically identified in stipulations below, shall occur within historic property boundaries, including any defined buffer zones. Portions of undertakings may need to be modified, redesigned, or eliminated to properly avoid historic properties.	Archaeologist, fuels officer; During design and implementation.	
	All historic properties within APEs shall be clearly delineated prior to implementing any associated activities that have the potential to affect historic properties. A. Historic property boundaries shall be delineated with coded flagging and/or other effective marking. B. Historic property location and boundary marking information shall be conveyed to appropriate Forest Service administrators or employees responsible for project implementation so that pertinent information can be incorporated into planning and implementation documents, contracts, and permits (e.g., clauses or stipulations in permits or contracts as needed).	Archaeologist, fuels officer; During design and implementation.	
	Buffer zones may be established to ensure added protection where qualified Heritage Program staff determine that they are necessary. The use of buffer zones in avoidance measures may be applicable where setting contributes to property eligibility under 36 CFR 60.4, or where setting may be an important attribute of some types of historic properties (e.g., historic buildings or structures with associated historic landscapes, or traditional cultural properties important to Indians). A. The size of buffer zones must be determined by qualified Heritage Program staff on case-by-case bases. B. Landscape architects and qualified Heritage Program staff may be consulted to determine appropriate view sheds for historic resources. C. Indian tribes, or their designated representatives, and/or Native American Traditional Practitioners shall be consulted when the use or size of protective buffers for Indian traditional cultural properties needs to be determined.	Archaeologist, During design and implementation.	
	When any changes in proposed activities are necessary to avoid historic properties (e.g., project modifications,	Archaeologist, fuels officer; During	

	redesign, or elimination; removing old or confusing project markings or revising maps or changing specifications), these changes shall be completed prior to initiating any project activities.	design and implementation.	
	Monitoring by heritage program specialists may be used to enhance the effectiveness of protection measures. The results of any monitoring inspections shall be documented in cultural resources reports and the Infra database.	Archaeologist, fuels officer; During design and implementation.	
	The Zone Archaeologist in conjunction with fuels, vegetation management, or fire specialists as necessary, shall develop treatment measures for at risk historic properties (as defined in SHPO approved Region 5 modules and agreements) designed to eliminate or reduce potential adverse effects to the extent practicable by utilizing methods that minimize surface disturbance, and/or by planning project activities in previously disturbed areas or areas lacking cultural features. A. Fire lines or breaks may be constructed off sites to protect at risk historic properties. B. Fire shelter fabric or other protective materials or equipment (e.g., sprinkler systems) may be utilized to protect at risk historic properties. C. Vegetation may be removed and fire lines or breaks may be constructed within sites using hand tools, so long as ground disturbance is minimized and features are avoided, as specified by the qualified Heritage Program staff. D. Fire retardant foam and other wetting agents may be utilized to protect at risk historic properties and in the construction and use of fire lines. E. Surface fuels (e.g., stumps or partially buried logs) on at risk historic properties may be covered with dirt, fire shelter fabric, foam or other wetting agents, or other protective materials to prevent fire from burning into subsurface components and to reduce the duration of heating underneath or near heavy fuels. F. Trees that may impact at risk historic properties should they fall on site features and smolder can be directionally felled away from properties prior to ignition, or prevented from burning by wrapping in fire shelter fabric or treating with fire retardant or wetting agents. G. Vegetation to be burned shall not be piled within the boundaries of historic properties unless locations (e.g., a previously disturbed area) have been specifically approved by qualified Heritage Program staff. H. Fire crews may monitor sites to provide protection as needed.	Archaeologist, fuels officer; During design and implementation.	

	Qualified Heritage Program staff shall determine whether fire, prescribed fire, or treatments within site boundaries shall be monitored, and how such monitoring shall occur.	Archaeologist, During design and implementation.	
	Use of any standard protection measures on historic properties for fire, and hazardous fuels, shall be documented in heritage program reports, detailing equipment type, extraction techniques, conditions of use, environmental conditions, project results, effectiveness of protection measures, need for changes, and recommendations for future use.	Archaeologist, fuels officer; During design and implementation.	
	Felling of hazard, and other trees within historic properties under the following conditions: A. Trees may be limbed or topped to prevent soil gouging during felling; B. Felled trees may be removed using only the following techniques: hand bucking, including use of chain saws, and hand carrying, rubber tired loader, crane/self-loader, helicopter, or other non-disturbing, qualified Heritage Program staff - approved methods; C. Equipment operators shall be briefed on the need to reduce ground disturbances (e.g., minimizing turns); D. No skidding nor tracked equipment shall be allowed within historic property boundaries; and E. Where monitoring is a condition of approval, its requirements or scheduling procedures should be included in the written approval.	Archaeologist, fuels officer; During design and implementation.	
	Post-project monitoring shall be implemented and qualified Heritage Program staff shall complete in treatment areas where deferred inventory was approved. The qualified Heritage Program staff shall determine the scope and schedule for any additional associated monitoring. Information from any post-project inventory, monitoring, or evaluation shall be used to assess the effectiveness of this non-intensive inventory approach. The results shall be reported in the Forest's Annual PA Report or supplemental report.	Archaeologist, During and after implementation.	
	When Avoidance Is Not Possible: If a procedure described above cannot be implemented to protect cultural resources, the Zone or Forest Archaeologist shall immediately consult with State Historic Preservation Office (SHPO). If the SHPO and Forest agree that the activity would not diminish or destroy those qualities that may make the property eligible or potentially eligible (including potential visual impacts if NRHP criteria A or C may be relevant) then the permitted use may continue without further mitigation.	Archaeologist, fuels officer; During design and implementation.	
	Unanticipated Discoveries: There is always the possibility that surface and sub-surface cultural resources would be located during project operations.	Archaeologist, fuels officer; During implementation.	

	Should any additional project cultural resources be located, the find must be protected from operations and reported immediately to the Cultural Resource staff. All operations in the vicinity of the find would be suspended until the sites are visited and appropriate recordation and evaluation is made by the Zone or Forest Archaeologist.		
Noxious Weeds	Avoid any known noxious weed infestations during project implementation.	Botanist and fuels officer: During implementation.	
	Use of weed free erosion control materials.	Botanist and fuels officer: During implementation.	
	Require equipment and personnel (boots/tools) to be free from noxious weeds and soil before working in the project area (i.e. power wash prior to accessing work area)	Botanist and fuels officer: During implementation.	
Range	Build a drift fence along the boundary of the Monument and Tule River Indian Reservation, where the fuels reduction activities create openings for cattle to trespass.	District ranger, management staff, and permittee: During implementation.	
Watershed /Soils	Implement BMPs as appropriate to selected alternative and final project design.	Fuels officer and hydrologist; During design and implementation.	
	SMZ and Special Aquatic Features prescriptions: • Fuel management activities would not occur in SMZs, avoid direct lighting within SMZ, • No removal of live vegetation, • Any slash that accidentally enters into this zone would be removed by hand, piled, and burned outside of SMZ. RCA prescriptions outside the SMZ: • Fuel management activities could remove small trees and brush. • Slash material generated would be piled and burned. • Burn piles would not be placed up against large woody debris or large live trees. • Retain 10 to 20 tons of large woody debris per acre where present for the benefit of the relictual slender salamander. • To the fullest extent possible, and with due consideration given for topography, lean of trees, landings, utility lines, local obstructions, and safety factors, trees would be felled away from water courses.	Fire burn boss; During implementation.	

Wildlife	Notification of the district wildlife biologist is required should a nest or den site of any TES species become known during project implementation.	Wildlife biologist and fuels officer; During design and implementation.	
	For spring burning, active northern goshawk and spotted owl nest sites would be avoided. This would require surveys prior to burning and either putting in handline around the nest stand or modifying the boundary of the burn unit to exclude the area. Portions of two designated northern goshawk PACs fall within the project area. A limited operating period of February 15 through September 15 for activities within one-quarter mile of the nest site may be required if disturbance to nesting activities is possible.	Wildlife biologist and fuels officer; During design and implementation.	
	For prescribed fire treatments, use firing patterns, fire lines around snags and large logs, and other techniques to minimize effects on snags and large logs.	Wildlife biologist and fuels officer; During design and implementation.	
	Condor activity during implementation phases of the project will be monitored. Should satellite data suggest presence of condors on the Forest that would result in occupation of the TRRP vicinity, a limited operating period will be implemented in consultation with the Condor Recovery Team.	Wildlife biologist, During design and implementation.	